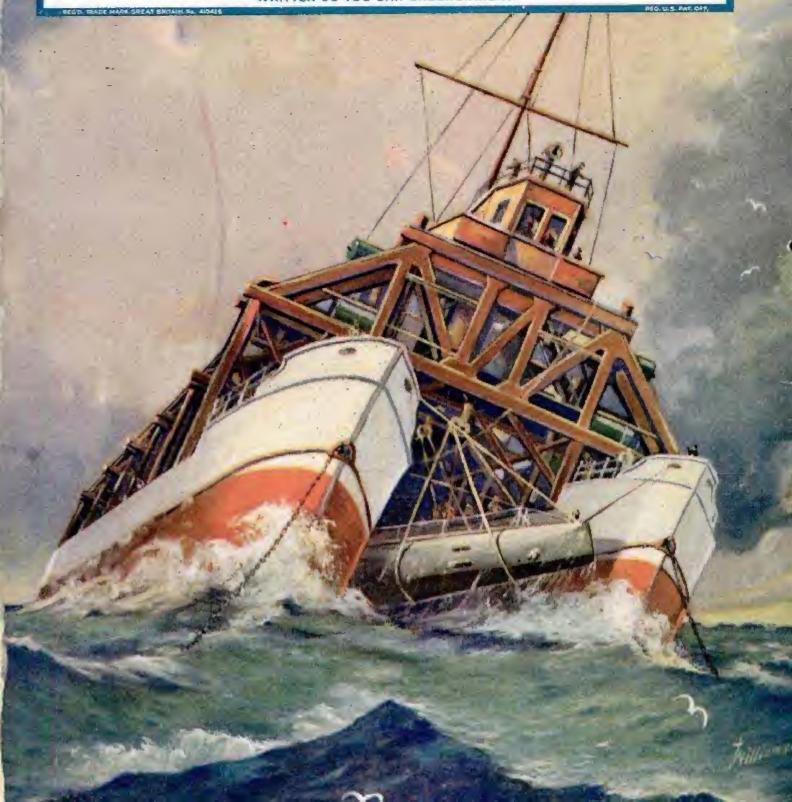
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POPULAR MECHANICS

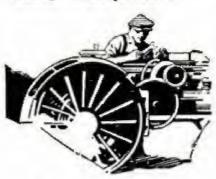
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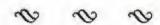
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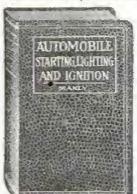
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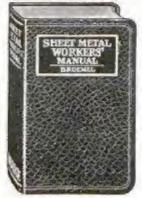
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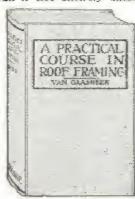
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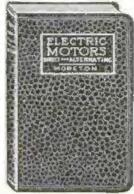
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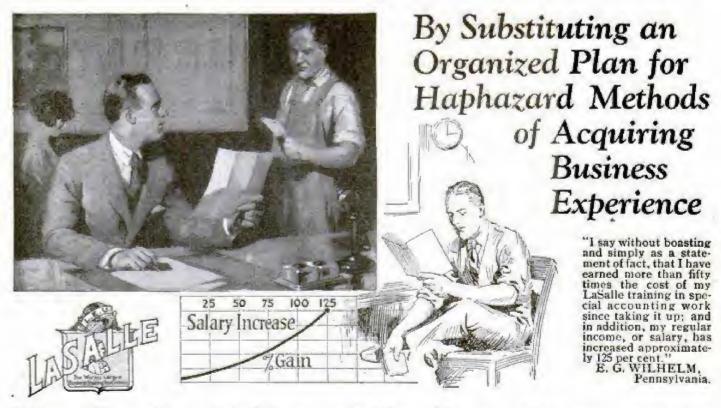
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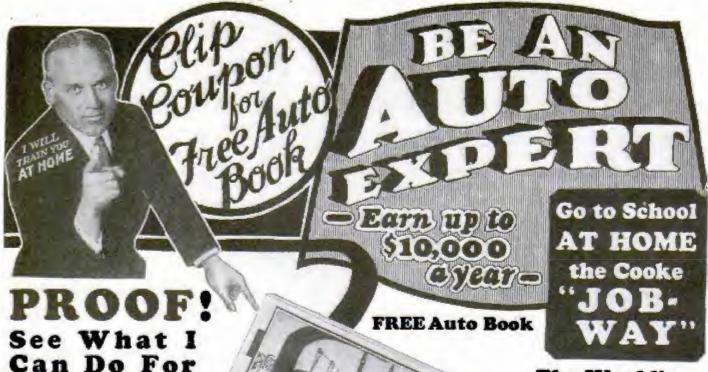


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CHICAGO \



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ODAY I dropped in for a last word with the boys at the office. And as I saw Tom and Dave there at the same old desk it came to me suddenly that they had been there just so the day I came with the firm four years ago,

"When I started here I was put at a desk and given certain routine things to do. It was my first job and I took it as a matter of course. But after a few months I began to realize that I was nothing but a human machine-doing things that anyone could do and that I couldn't expect to advance that way.

"So I had a talk with the manager, and I'll never forget what he said: 'If you want to get ahead, put in some of your spare time getting special training along the lines of your work. We want men who care enough about their future not only to do their work well, but to devote part of their spare time to preparation for advancement.'

"That very night I wrote to Scranton and a few days later had started studying evenings at home. Why, do you know, it gave me a whole new interest in our business. In a few months I was given more important work and more money. Since then I've had three increases. Six months ago I was put in charge of my department, and now my big chance has come-I'm to be manager of our western branch at \$5000 a year!

"Tom and Dave could never see any sense in my studying nights-they said eight hours was enough for any man to be bothered with business. They had the same chance I had -they could have been big men in the firm today. But they stood still while I went up to one of the best jobs in our business. It just shows what spare-time training will do."

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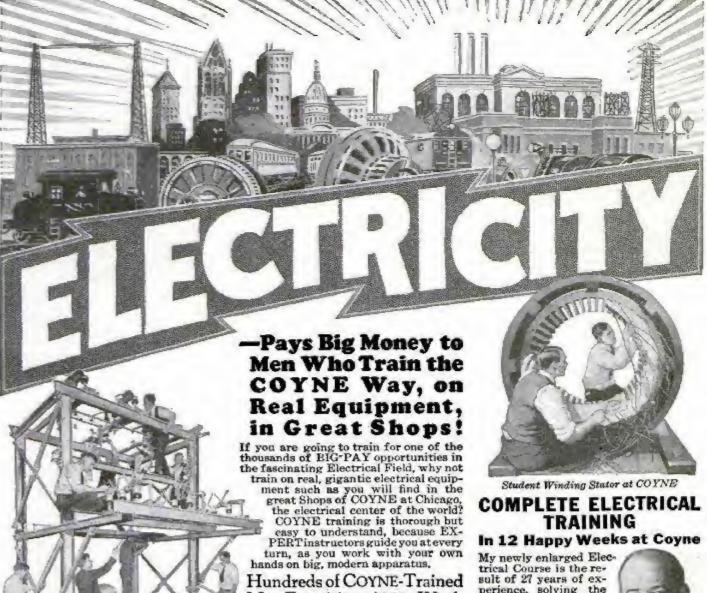
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To Read Plans and Blue Prints, Too

No need to stop at even a brick-layer's big pay. While I'm teaching you the trade, I also teach you to read plans and blue prints. Also to estimate and lay out work. give you the extra knowledge that a man needs to become foreman, superintendent, contractor or builder. There are opportunities, any number of them, for the ambitious man who has this EX-TRA knowledge.
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Chicago . 1.50
New York City . 1.50
Pittsburgh . 1.62½
Kansus City . 1.37½
St. Louis . 1.75

These figures are for regular time. For overtime there is always a bonus— either time-and-a-half or DOUBLE time.

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The building business—the greatest industry in the world—is going ahead by leaps and bounds. Experts say 1926 will be a record year. That means plenty of work and big wages. The time is ripe, right now, for you to get started. No reason why YOU shouldn't make the same big money a lot of others are making. You can, a lot of others are making. You can, easily - QUICKLY. Let me show you how.

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Herkimer, N.Y.

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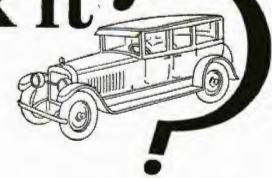
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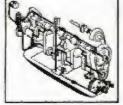
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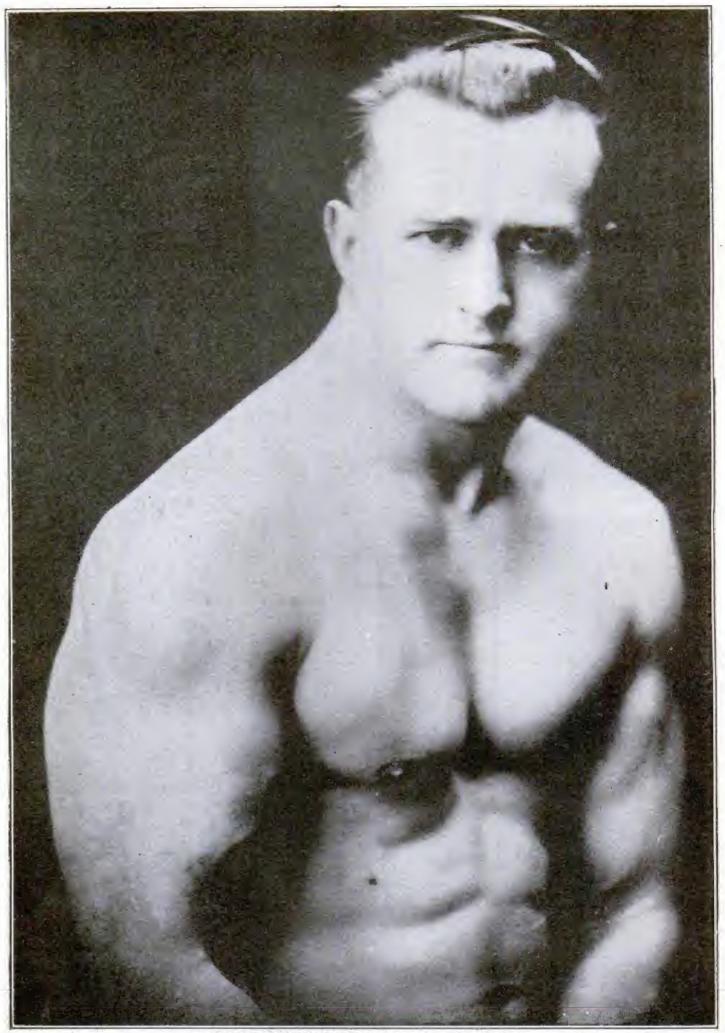
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Lift 200 lbs. or more overhead with one arm; bend and break a horseshoe; tear two decks of playing cards; bend spikes; chin yourself with one hand.

CAN you do any of them? I can and many of my pupils can. It is remarkable the things a man really can do if he will make up his mind to be strong. It is natural for the human body to be strong. It is unnatural to be weak. I have taken men who were ridiculed because of their frail make-up and developed them into the strongest men of their locality.

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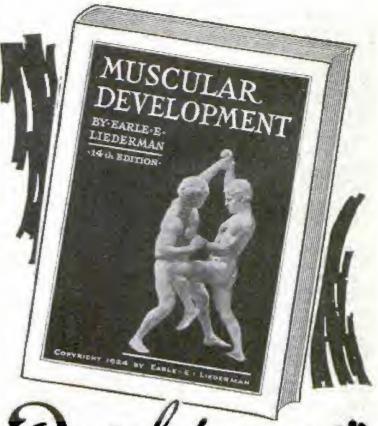
These are the days that call for speed. It once took four weeks to cross the ocean—now it takes less than one. In olden days it took years to develop a strong, healthy body. I can completely transform you in 90 days. Yes, make a complete change in your entire physical make-up. In 30 days I guarantee to increase your biceps In 30 days I guarantee to increase your finceps one full inch. I also guarantee to increase your chest two inches. But I don't quit there. I don't stop till you're a finished athlete—a real strong man. I will broaden your shoulders, deepen your chest, strengthen your neck. I will give you the arms and legs of a Hercules. I will put an armor plate of mustle over your entire body. But with it come the strong, powerful lungs which enrich the blood, putting new life into your entire being. You will be bubbling over with strength, pep and vitality.

Doctor Who Takes His Own Medicine

Many say that any form of exercise is good, but this is not true. I have seen men working in the factories and mills who literally killed themselves with exercise. They

mills who literally killed themselves with exercise. They ruined their hearts or other vital organs, ruptured themselves or killed off what little vitality they possessed.

I was a frail weakling myself in search of health and strength. I spent years in study and research, analyzing my own defects to find what I needed. After many tests and experiments, I discovered a secret of progressive exercising. I increased my own arms over six and a half inches, my neck three inches and other parts of my body in proportion. I decided to become a public benefactor and impart this knowledge to others. Physicians and the highest authorities on physical culture have tested my systems. and impart this knowledge to others. Physicians and the highest authorities on physical culture have tested my system and-pronounced it to be the surest means of acquiring perfect manhood. Do you crave a strong, well-proportioned body and the abundance of health that goes with it? Are you true to yourself? If so, spend a pleasant half hour in learning how to attain it. The knowledge is yours for the selving.



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It contains forty-three full-page photographs of myself and some of the many prize-winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. This will not obligate you at all, but, for the sake of your future health and happiness, do not put it off. Send today right now, before you turn this page.

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"Last week m v earnings amounted to \$554.37; this week will go over \$400. Thanks to the N. S. T. A."



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"I'm now President, and my earnings for 1925 will easily expeed the five figure mark, thanks to your training."

You're Fooling Yourself

-if You Think These Big Pay Records Are Due to LUCK!

But don't take my word for it! When I tell you that you can quickly increase your earning power, I'LL PROVE IT! FREE! I'll show you hundreds of men like yourself who have done it. And I'll show you how you can do it, too.

J. E. GREENSLADE, President National Salesmen's Training Association

LL come directly to the point. First you'll say, "I could never do it. These men were lucky." But remember the men whose pictures are shown above are only four out of thousands and if you think it's luck that has suddenly raised thousands of men into the big pay class you're fooling yourself!

Easy to Increase Pay

But let's get down to your own case. You want more money. You want the good things in life, a comfortable home of your own where you can entertain, a snappy car, membership in a good club, good clothes, advantages for your loved ones, travel and a place of importance in your community. All this can be yours. And I'll prove it to you.

First of all get this one thing right, such achievement is not luck—it's KNOWING HOW! And KNOWING HOW in a field in which your opportunities and rewards are ten times greater than in other work. In short, I'll prove that I can make you a Master Salesman—and you know the incomes

good salesmen make.

Every one of the four men shown above was sure that he could never SELL! They thought Salesmen were "born" and not "made!"

not "made!"

When I said, "Enter the Selling Field where chances in your favor are ten to one," they said it couldn't be done. But I proved to them that this Association could take any man of average intelligence, regardless of his lack of selling experience, and in a short time make a MASTER SALESMAN of him—make him capable of earning anywhere from \$5,000 to \$10,000 a year. And that's what I'm willing to prove to you, FREE.

Simple as A. B. C.

You may think my promise remarkable. Yet there is nothing remarkable about it. Salesmanship is governed by rules and laws. There are certain ways of saying and doing things, certain ways of approaching a prospect to get his undivided attention, certain ways to overcome objections, batter down prejudice and outwit competition.

Just as you learned the alphabet, so you can learn salesmanship. And through the NATIONAL DEMONSTRATION

METHOD—an exclusive feature of the N. S. T. A. System of Salesmanship Training—you gain the equivalent of actual experience while studying.

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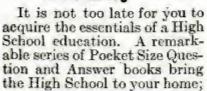
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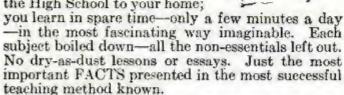
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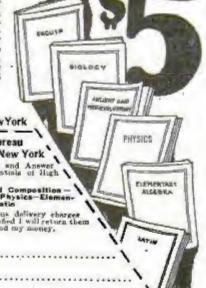
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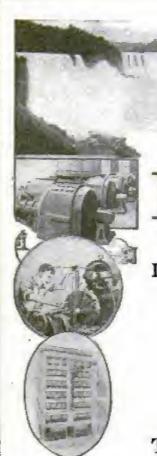
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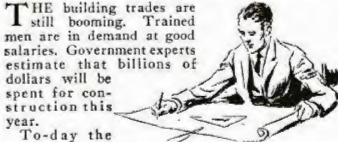
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For a moment the questions overwhelmed me.

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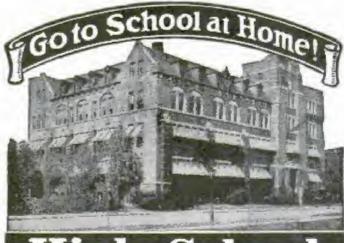
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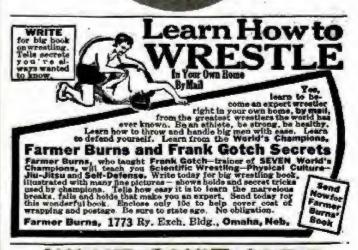
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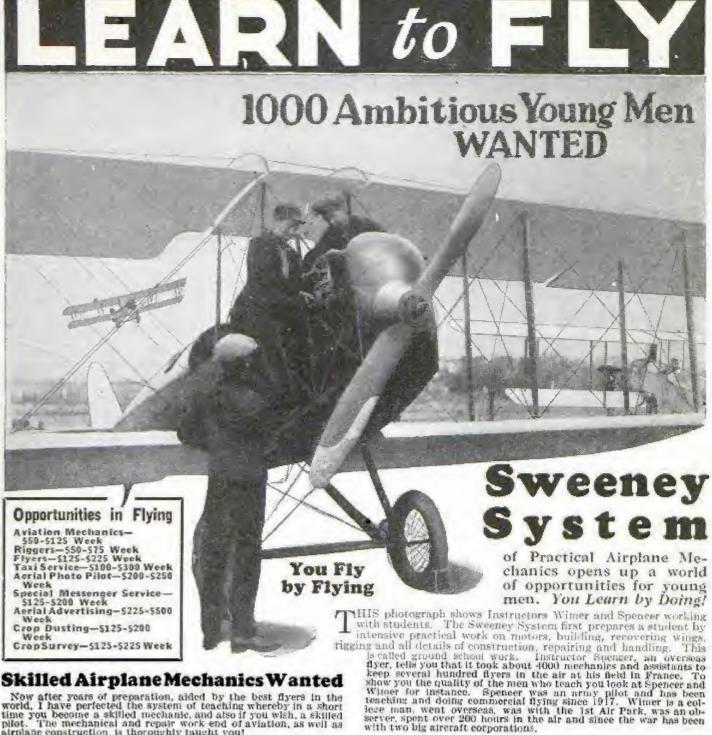
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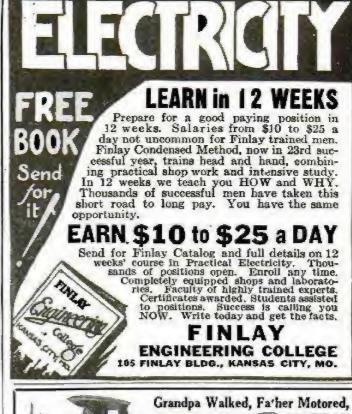
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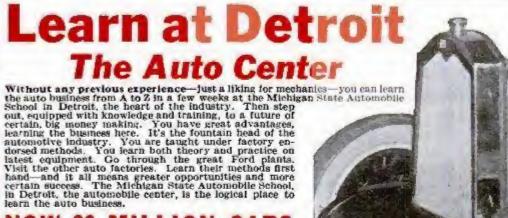
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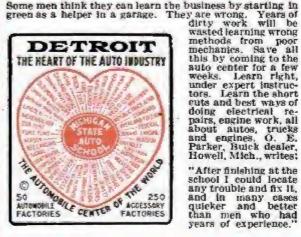


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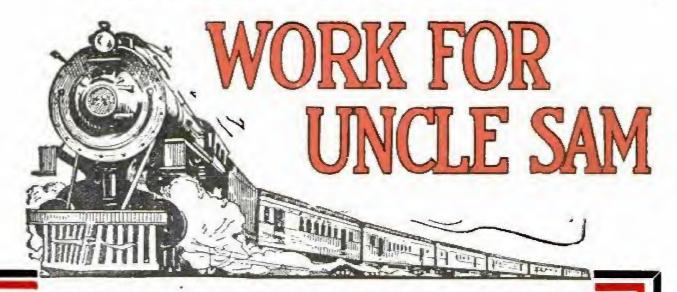
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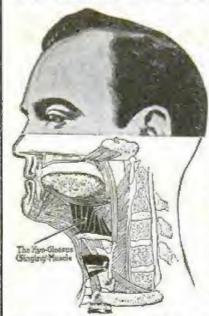
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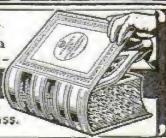
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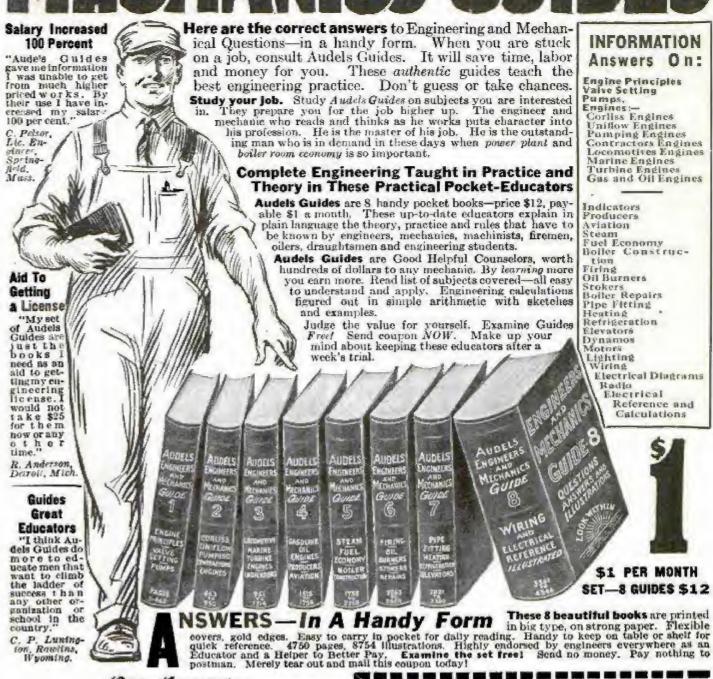
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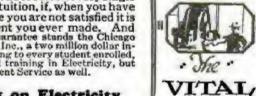
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SELL by Mail! Rig Profits! Books,
Formulas, Novelties, Bargains, Particulars
Free! Elico, 523 South Dearborn Street,
Chicago.

SALES Agents—Take orders Bleb Crache.

SALES Agents—Take orders High Grade Tailored Neckwear. Guaranteed for 6 months. Insured never to roll, twist, stretch or bused. Not sold in stores. Write for beautiful line samples. Better-Made Cravat Co., Wholesale Dept. 6, Columbus, Obio.

GET our line first. Blg pay dally. Best made shirts, shoes, sults, pants, raincoats, etc. Sample kit free. Jim Montgomery, 320 So. Franklin, Chicago.

FIREE Sample. "Hain Shield Winer." Retails \$1.00—Costs (25 cents). Sold Clear and Rainy Days. No Cloth—No Paste—No Attachment. (1) Rub koops Windshield elear (48) hours. Experience Unnecessary. NuLife Corporation, Hartford, Conn.

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FIBRE Brooms—detachable handles, fine finish. Good profits, repeat sales. The Fibre Broom People, 147 New Jersey Ave., Brooklyn, N. Y.

AGENTS:—Mesco Corn and Callous Remover will build you a steady repeat husiness. Send today for pocket-size triul outlit. The Moss Co., 275 Searle Bidg., Rechester, N. Y.

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BE your own boss. Build permanent business. Take orders men's—boys' tailored units—\$13.91—\$22.50—\$4 commission. Free outfit. Pashion Ciothing, 2554N Lake, Chicago.

CREATE Mail order or Local Business. New Simple plan gets money, Easily, Quick-

ored suits—\$13.93—\$22.50—\$4 commission. Free outifit. Fusion Clothing, 2654N Lake, Chicago.

CREATE Mail order or Local Business. New Simple plan gets money, Easily, Quick-ly, Sieadily, Particulars Free. Edw. Burke, 733 Nineteen, Oakhand, Calif.

AGENTS make \$40 to \$80 weekly selling typewriters re-manufactured like new by the "Young Process." Lowest prices and easiest terms over offered. Big Commission—no investment—real opportunity to start in business for yourself. Write Today. Young Typewriter Co., Dept. 7163, 654 W. Bandolph St., Chicago, III.

GET Free Sample Outif! Earn \$3.600 to \$5,600 a year selling most complete line guaranteed Hosiery and Underwear in America. No experience needed. You can become District Manager and have others working for you—if you act quick! Write today. Malloch Knitting Mills, 563 Grant St., Grand Rapids, Mich.

64 MILES on I gallon—Scientific Gas Saver. All autos. Demonstrating model free. Critchiow. G-132, Wheaton. III.

IMPORTED—Patented, 5-color pencil; writes Red. Blue, Bluck, Green. Indelible; sells on sight, everyone a prospect; no competition. Sample \$1.00. Square-Deal Co., P-236 West 55th St., New York.

CLEAN up 50c to \$1,00 each sale. Paid immediately. No delivery, license, nor stock necessary. Free particulars. Mission Factory, A19PM, 518 N. Halsted St., Chicago, GETS-U-OUT Tire Lug—New patented auto accessory. Just out. One minute demonstration. Sure sale, Absolutely prevents auto getting stuck in med, sand or snow. Big profit. Money back guarantee. Write for exclusive sales torritory. Arthur J. Benson, 338 W. 47th St., Dept. 3, Chicago.

MEN wanted to sell my new puncture-proof inner tube; demonstrate by driving

MEN wanted to sell my new punctureproof timer tube; demonstrate by driving
nalls into tire. In tests have given good
service after having 500 notil holes in them.
Doubles tire mileage. Sold under moneyback guarantee. Big money and exclusive
territory. Free tube offer. Write D. M.
Millhum, 334 W. 47th St., Chicago.

INCH Display Advertisement 166 Magazines Year \$50.
Allantic City, N. J.

QUICK-SELLING Novelty. Complete
radio set embodied in beautiful ring. Re-

utility Shilling Novelty, Complete radio set embodied in beautiful ring. Retailing at only 50c. One agent averages \$125 weekly. Agent's Sample 25c. Particulars free. Ross Merchand. Station Eye, New York.

WILDFIRE seilers! America's cheanest 25c Chemical Windshield Rainclothe. Sample. Box 265, Station C. Los Angeles.

QUIT ringing doorbells. I made \$800 monthly, no soliciting, no goods to buy, Why not you? Details free. R. McNown, 503 Wilkinson, Omaha, Nebr.

AGENTS, Distributors, clean up quickly. No competition. Sell "Prexto," Necessity and Novelty. New Moth-killer, decdorant, flies, germ and Insect chaser. Guaranteed, sells at sight. I to 6 every home. Not a fliquid or powder. Retails 25c each, costs \$1,25 dozen. Free sample. Franco Mfr., 530 N. Walter, Chicago.

\$5.00 REWARD for any foul spark olug we fall to fire with our ignition Booster. Agents clearing \$100 and over weekly selling our Newly Patented Auto Specialties. Others doing it, so can you. Jackson Mfg. Co., 1818 Cartis St., Denver, Colo.

MANUFACTURE your own products. list reliable plans, patterns, processes for making newest, fast-solling mail order, agents' goods, toys, novelties, Mfg. Bureau, 3937A Tracy, Kansas City, Mo

SELLING Like Blazes! Eleven Diece totlet goods assortment at \$2.00 with two piece carring set Free to your customers. 100% preft. Davis Products Co., Dect. 56, 1321 Carroll, Chicago.

SELL charming Fashion Frock dresses. \$50,00 weekly easy. Below retail prices. Guaranteed. Free outfit and sample dresses. Fashion Frocks, Inc., Dept. 3-AR, Cincinnati, Ohio.

WANT \$50.00 weekly for spare time? And fine automobile free? Write for smar-ing money-making plan. No experience ner-essary. Easy work. Address Desk BC3. Healtho Products Co., Cincinnati, Ohio.

MARVELOUS Invention! Does away with phonograph needles. Preserves records. Saves \$25 in needles. Pays \$90 weekly. Sample on approval if requested. Evernlay, Desk B-3. McClurg Bidg., Chicago.

NEWEST Invention! Sells everywhere. Automatically prevents telephone and from cords from tangling and kinking. \$90 week-ly. Samples for test if dealred, Never-knot, Dept. 3-1. McClurg Bldg., Chicago.

SIGN agents. Wonderful s never tarnish. Samples free. I Cornoration. New Haven, Conn. Wonderful sign letters; amples free. Monroe Sign

Corporation, New Haven, Conn.

AGENTS, Salesmen, get out sure fire proposition, Details 10c. The Exchange, 214 So. 13th St., Allentown, Pa.

AGENTS make big money selling our household gords, Webster Co., 522 Wrightwood, Chicago, Ill.

SELL \$50 mail shorthand course for \$10.

Macewan, 720 N. Michigan, Chicago,
GREATEST Sensation of the specialty world. Over 1,000 genuine embossed Display Signs for retail merchants. Write for information. Artistic Signs, 799-R. Broadway, New York.

AGENTS, earn big money soliciting yearly subscriptions for magazines; Ladies' Home Journal, etc. Acheson, 2226 West Carv. Richmond. Va.

BIG Money, Your Own Business, One to Cleaning and Pressing Shop, Compile astructions, Acheson, 2218 West Can ate Cleaning and instructions. A Richmond, Va.

SALESMEN—Our men earn \$5 to \$7.50 per hour selling Supreme Shirts. Write for Free kit. Supreme Shirt Co., 276-M Fifth Avenue, New York.

SPRING clean-up time in women's shoe ame. Main or side line. No investment, ig money. Style-Arch Shoes. Dept. C-4, game. Main or 9 Big money. Style Cincinnati, Ohio,

AGENTS—Distributors: Big money selling Ford Thermatic Carburetor Regulators. Free demonstrator, "Watch it work," Need managers in few districts, Owens Company, 1919-B Broadway, New York.

Company, 1919-B Broadway, New York.

MARVELOUS New Invention 400%
Profit. Liquid Quick Mend for hostery and fabrics. Tremendous demand. Over hundred other fast sellers. Lical and General Agents, J. E. Johnson Co., Dept. 438, 69 E. South Water St., Chicago.

FREE Booklet describes 52 plans for making \$20,00 to \$100.00 weekly in home or office business of your own. Downs Co., 2325 A Myrtle, St. Paul, Minn.

AGENTS Wanted to mail circulars. Fast selling goods. New methods. Big profits.

selling goods. New methods. Big profits. Particulars free. Peerless Service. Water-

rattenants tree. Peerless Service. Water-ville, Me.

CADDIE—For wife and sweetheart, guar-anteed seller, 75 cents parcel post. Auto-bronze Company, 1527 Fawn Street. Phila-

bronze Company, 1527 Fawn Street, Finia-delbhia.

BIG Mency to Live Agents, Selling Burrit to hotels, bakeries, hospitals, restaurants, Everyone a prospect and buyer. No poison. Every package guaranteed. Territory rights given and protected. Write for details at once. Wex Sales Co., 657 34th St., Milwankee, Wis

YOU Can Make Good Durable Paint and Varreish 40c per gallon. Write Dept. 2, Emmelmann Bros. Mfg. Co., Indianapolis, Ind.

AGENTS—Large Profits selling United No-Gement Tube Patch. United Patch Company, Covington, Ky.

GET posted—Good prices paid for butterflies, insects. See Sinclair display advertisement rates 42

Girl poster. See Sinclair display advertisement, page 42.

CAN you beat this money making line?
Blg variety of shirts, including allks, with a spiendid line of union made work and

a splendid line of union made work and flannel shirts, overalls, coveralls, work pants, play soits, all guaranteed. Sell direct to wearer full or spare time. No experience required. Write today for Free Selling Outth. Nimrod Shirt Co., Dept. 8, 4922-24-26-28 Lincoln Ave., Chicago.

EARN \$15.00 Daily. Sell Uptheygo Cuff Buttons Direct to Wearers. Stretch Like Rubber, Permits Sleeves to Be Raised over Elbows Instantly, without Unbuttoning Same. Lowered they close automatically. A New High Grade Durable Convenience that Appeals to All. Write Today. Flexo Mfg. Com., Shebnygan, Wis.

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SUCCEED With Your Own Products—Make them yourself. Formulas, Processes, Trade-Secrets, Modern master methods, Catalog free. B. Thaxly Co., Washington, D. C. AGENTS. Our Silent Selling Method

AGENTS. Our Silent Selling Method should make big money for you. No experience required. Colman Mercantile Co., 4421 Manchester Avenue, St. Louis, Mo. BUILD spiendid business making chipped

BUILD spiendid business making chipped glass number and nume plates, signs, checkerboards. Write for particulars, Simplex Utility Co., 1133 Broadway, New York, AGENTS, No-Water hand soap in tubes taking autoists by storm; washes dirtiest hands perfectly clean without water; outck safe, big profits. National Service Co., Dept. "A." Pierre, S. Dak.

TWELVE Big Money-Making Opportunities, Including America's Greatest Magazine and Big Wholesale Catalog. All for 25c. Free--14 Articles worth \$2.00. Limited Offer. Write Quick, Lawrence Products Company, Beaver Dam, Wis.

AGENTS—Sell 5c fast selling candy specialties to stores. Big profits. Lorrac Products Co., Albany, N. Y.

AGENTS \$500 monthly easy selling Magic Gas. New discovery. \$1 box equals 33 gallons gasoline. Proven morfus, Your name on cans. 380% profit. Write quick, P. A. Lefelbyre & Co., Dept. P. Alexandria, Ont., Canada.

Byre & Canada.

Ont. Canada.

SOMETHING new—Presto Rubber Repair for tires, tubes; all rubber goods put on cold, no heat, acid or tools; vuicemizes itself in few minutes. Sells to auto owners and dearers, sample free. Pioneer Products Co., Dept. A. Roebling, N. J.

MANUFACTURE Chipped Glass Numbers; particulars Free. Beveridge, 160-22 Locust Avenue, Jamaica, N. Y.

AGENTS sell 60 5 cent packages chewing gum or candy mints. You keep \$1,00, Send us \$2.00, We trust you. Acheson, 2247 West Cary, Richmond, Ya.

YOU can be your own boss with our Key-Check outfit. Good for \$5 a day stanning names on pocket key checks, fots, etc. Sample check with your name and address, 20 cents. Pease Dic Works, Dept. M. Windester, N. H.

MANUFACTURE land wood polishers, dusters. Newhall, 65 Court, Brooklyn, N. Y.
HY-GRADE agents can average \$50.00 ner week besides bonus, solling Household Products, Premiums, Co-operative Sales Plan makes Sales cary. County Sules Agents. Wanted. Write now for territory. Hy-Grade Chemical Co., Winthrop. Me.

"IMMEDIATE" Stone Houses, \$100. Agents fortune-maker. Bandley, Box 171, New Orleans, La.

AGENTS—50% commission. Full line glove slik lingeric and guaranteed hostery, mill to weuer; lowest prices. Get particulars. Wright Hostery Mills, Paladeania, Pa.

Pa.

AGENTS—Flashing device eastly sold to garages, barber shops, shoe shining pariors, etc., using globe signs and advertising, inexpensive. Real proposition for live wires, 100% profit. Exclusive territory. Phelos Electric Co., 29 So. Clinton St., Chicago.

GENERAL Distributors, Agents, Saleamen—Send for our live wire proposition and sample. Exclusive territory to workers. See our dispiny ad on page 157. Waltace Rim Tool Mrg. Co.

ARE You Old at Forty? See our adver-tisement on page 153 of this issue. The Electro Thermul Company, 2137 Main Street, Steubenville, Ohio.

GIVE Polishing Cloth Free with every package Rust and Stain Remover. Make 233%. Get Particulars. Quality Products, 2712-A Elliott, Minneapolis, Minn.

MAKE 1926 pay you \$65,00 week. Our men make this and more selling sinces direct to wearer. Superior Shee Co., Bangor, Me.

ANY man bands with paint brush can start furniture refinishing, job nainting, handyman stop on nearly nothing; mostly all profit; experience not needed; winning plan brings customers quickly. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

\$8.50 TO \$20.00 Daily pay, Introducing New Insured Hosiery for men, women, children, 57 styles, 40 colors. Must wear or replaced free. Repeat orders sure. Nyiard made \$505 in one month. Edwards \$400.00, Mrs. Bone, \$445.25. Why not you? Even spare time work should pay you \$5 per hour. Your Pay Daily in advance. We deliver and collect. You spend all your time writing orders. No experience or capital needled. We furnish samples. All grades, colors including silks. No matter what you are doing new, write for our offer. Macochee Tertile Company, Card 2563, Cincianati, Ohio. AGENTS. Salesmen—Sell New Thermostatic Automatic Carbureter Control Attachment for Pords. Big profit, full or part time. Burns 95% sir. Doubles Mileage. Attached in 2 minutes. No drilling. Does automatically exactly what Ford manual savs do by hand. Cadillac now using Thermostatic Carbureter Control under Blancke Heense. Write today. A. C. Blancke & Co., Dept. 895CX, 892 Lake S4., Chicago.

"C-WELL" Electric Lamp for Sewing Machines. Fits all makes. Every woman with a sewing machine will buy. Liberating Co., 799 Broadway, New York.

AGENTS—Comb cleaners, self-threading nod other report sellers to house the

AGENTS—Comb cleaners, self-threading needles and other good sellers to housewiles get the money. Particulars. L. Miller, Box 3, Tremont Station, New York.

PATENTS. Time counts in applying for patents. Don't risk detay in protecting your ideas. Send sketch or model for instructions or write for Free book "How to Obtain a Patent" and Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O Brico. Registered Patent Attorney, 58-E Security Bank Building directly across street from Patent Officer, Washington, D. C. See pages 140 and 141.

AGENTS-Mail dealers. Concealograph, Secret Correspondence System. Sample 10c. Particulars free. Liggett, 875 Drexel Bldg., Philodelphia.

A \$5,000 A YEAR Job. You can make it worth that and more. 400% to 600% profits selling Perry Photo Medallions. No portraits so desirable. Indestructible, hand-colored, fade-proof. Built from photo supplied by customer. Guaranteed. No money risk. No margin of profit so big in any other line. Write. Perry Photo Novelty Corp., 1793 Jerome Ave., Dept. PM. New York.

REMPE E.-Z Typewriter Cleaser. Makes type cleaning a pleasure. Repeater. Ex-clusive territory. Remps Mfg. Co., 2827 Myrtle. Oakland, Calif.

66 MILES on 1 gallon—Scientific Gas Saver, All autos, Demonstrating model free, Critchlow, E-132, Wheaton, III.

AGENT'S Protector—Book every agent would have. Particulars Stamp. Mooreshould have. Pacticulars Made." LaPeer, Mich.

AGENTS Wanted Something new-Fyr-Fyter sails easily. Makes a spectacular demonstration: car owners, homes, factories, stores, practically buy on sight. Our men make \$10 to \$50 a day. Exclusive territory to producers. If you wish to establish a business of your own with unlimited possi-bilities for making big money, write us taday. Fyr-Fyter Co., 998 Fyr-Fyter Bids., Davion, Ohio. Dayton, Ohio,

AGENTS, Big profits. Best and cheanest window letters made. Easily applied. Dime brings five samples. Particulars free. Statbrite Co., 1115 Second Ave., New York.

WE pay \$200 Monthly Salary, furnish ear and expenses to introduce our guaranteed poultry and stock powders, cleaner, etc. Bigger Company, X 368, Springfield, III.

\$20 DAILY Selling Ver-I-Ezy Men's Shoes direct, Selt relatives, friends, neighbors first, Low priced. Give real comfort, long service, You take orders, keen big commission. We ship and collect. Full or part time, Write Now. Easy-wear Shoe Company, Dept. 229, Indianapolis, Ind.

\$100 WEEKLY — Pleasant Work; Appointing local agents to introduce Mother Hubbard Foods; no canvassing; no delivering; no money invested. Mother Hubbard, 556 Congress, Chicago.

AGENTS—Three big lines hosiery, silk underwear, men's slotts. Liberal commissions. Send for free illustrated catalogs. Helix Co., 213ta Fourth Ave., New York.

MAKE big money selling Eureska Patching Ruste. Patches fabric and rubber. Eureka Cement Co., 208 E 53rd St., Chicago, Ili.

DIRECT factory representative to sell changeable letter signs to merchants. Exceelent supportunity. Good income assured right men. Andress. Maze Manufacturing Co., Norwood Station, Chicago.

NEW camera takes and finishes photos in one minute. Make money selling cameras or taking photos. Exclusive territory. Crown Co., Dept. 951, Norwalk, Conn.

IF We Give You shoes made-to-your measure in any one 80 leathers, 50 different styles, will you keep them, wear them, show them to your friends as sample of our fill Made-To-Order shoes to sell at \$6.857 Advise us today. Your complete outfit will go forward absolutely free at once. Dept. 2000, Taitor-Made Shoe System. 933 Wrightwood, Chicago.

TAILORING Salesmen: Our guaranteed \$23.59 and \$31.50 tailored to order salts are \$10 to \$20 dollars cheaper than store ntices: commission in advance; monthly bonus; protected territory; heautiful assortment 6x8 swatches free. Our national advanctising campaign makes selling easy—hig repeat business. DeLonge's record \$343 in one week. In one state alone 47 men average \$77.18 weekly. J. R. Simpson, Dept. 1182, \$43 Adams, Chicago.

BRING Home the Bacon—selling Stuart's famous Food Flavors. Quick sellers. Big profits. Write for free sample and terms. C. H. Stuart & Co., 6567 Main, Newark. New York.

EVERYBODY uses Extracts. Self Due Double Strongth Extracts. Complete line of household necessities. Big repeaters. Write today. Due Ca., Dept. E-1, Attica, N. Y.

GIVE Away finest laundry soan Free. You'll make \$10 daily easy by new selling plan. Big repeat business. Write quick. Wolverine Soap Co., 28 Wolverine Bldg., Grand Rapids, Mich.

AGENTS: \$65 to \$100 a week. High grade all wool suits made to measure. \$25 and \$36. Biggest commission in advance. Money-back guntantee. Free sample outit, Write C. G. Ferrin, Mgr., Box 1997, Chi-

WONDERFUL! Startling! Amazing! Our Ex-Cel Luminous Crueffx and Magical (Luminous) Necklace shine brilliantly in the dark. Seil on first demonstration. Big profits to you. Write for further particulars, or better still, send for earnife and territory protection immediately. Crueffx \$1.50, Necklace \$1.00, postpaid. W. G. Hannan Co., Pert. B, 2509 So. State St., Chicago.

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SHOW Us the Housekeeper Who Likes to clean stair corners, Ideal Dust Shields keep corners clean. Agents wanted. Ideal Stair-way Equipment Co., Canton, Ohio.

START Business of Your Own. Increase your income. Catalogue dependable formulas free. S. and L. Laboratory, 321 Larimer, Pittsburgh, Pa.

AGENTS: 500% profit, "Happy Home Maker Shampso" builds your own big business, Martin of Indiana made \$75,00 in one day. Missouri man made \$750,00 one month. Exclusive territory. Geo. A. Schmidt & Co., Dept. P, 236 W. North Ave., Chicago.

COLD-LEAF Sign Letters; make and sell; 1,000% profits. Particulars, Johnston Co., Quincy, 111.

PORTRAITS, photo pillow tops, frames, sheet pictures, medailions, merchant's signs, food products, photo jewelry, guaranteed hose, tollet requisites, luminous crucifface, Catalog 50 specialties free. 30 days' credit, Jas. C. Bailey Co., Sta. C. Chicago.

MAKE Money, silvering mirrors, refinishing auto headtights, tableware; metal plating, bed stends, chandeliers, Outfits furnished. International Laboratories. Deut. 71, 309 Fifth Ave., New York.

AGENTS, both sexes, we manufacture and control new household article. Fast seller. Big profits. Exclusive territory. Write now. Connolly, 123 Liberty St., New York.

300% PROFIT—Quick Seller—Fast repeater. Sample Free. Bestover Products Co., 1941-PM Irving Park, Chicago.
AUTOMOBILE Specialities. Guaranteed formulas for all latest money makers. Lowest prices. Write for free lists. Morehy, Chemist, Tujunga, Calif.

REPLATE brassy worn-off Automobile parts, Reflectors, Bath Room Fixtures, Worn Spoons, Forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Looks like new. Use U-Kan-Plate Polish.
Positively no. mercury. \$1.00 half pints
postpaid. Satisfaction Gursniteed. Agests
wanted. Dept. A, U-Kan-Plate Co., Phila-

RABE Opportunity. Men and Women make enormous profits. Articles cost 5c sell quickly for \$1.00. Make \$15 to \$30 daily. Particulars Free, Baggs, 3239 Archer, Chicago, Ill.

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MAN in each town to plate auto parts, reflectors, bathroom fixtures, refluish beds, mirrors, chandelters; by new method. No capital or experience required. Simple plan of manufacturing at hume starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

AGENTS-Shine-Brite Polishing

Products, Box 522, Kankakee, Ill.

AGENTS make 500% profit hamiling auto monograms, sign letters, Novelty signs, etc. Catalog free. Hinton Co., 122 E. 58th St., Chicago, Ill

MAKE \$75-\$100 Weekly. Famous Sun-lite household products; Big Quantity Sell-er; You risk nothing. Your money back for every unsold item. Amazing offer free, Summit Specialty, Union City, N. J.

\$400 TO \$500 a month easily earned selling New Guaranteed Auto Discovery. Nothing else like it. Big demand; sure repeater. Free folder explains; get it today. Boons Specialty Co., Dept. 327a, today. Boons Boone, lowa.

AGENTS wanted to sell to Retail Stores our fancy signs; three colors, shaded with airbrush, great variety. C. Pohlmann, 929 Second Avenue, New York.

WHY Buy Other's Goods? Start your own profitable bushiess, making them. Pree valuable Literature tells how, including Chemist's Interesting Lists Guaranteed Reliable Formulas for Latest Specialties, Miller, Chemist, 1706-K Jetion, Tamma, Fla.

DON'T Prov. co. called "Master Portugae"

Pin.

DON'T Buy so-called "Master Formulas" (old recipe-book-stock-formulas). Get this Free. Interesting, Valuable literature describing Latest, Guaranteed, Special Manufacturer's Formulas for all lines talest specialties. Miller, Chemist, 1706 Jetton-G, Tanpa, Fla.

Tanpa, Fig.

IF you want good live agents—fellows who can get the business—ask me have others are doing it. I'll gladly render the necessary assistance. M. L. Rund, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

ATTABOY—Pung Chow and Joker, Greatest Augusteent games ever played on Rile.

ATTABOY—Pung Chow and Joker, Greatest Amusement games ever played on Billiard or Pool Table. Brooks Mfg. Co., 1185 44th Street. Brooklyn. N. Y.

OVER 169% Profit. Self-Lighting Gas and Cigar Lighters. Everybody interested; repeat business. Sell individuals dealers, subagents. Particulars Free. P. Bernhardt, 148 Chambers St., New York.

AGENTS: Full or spare time—to sell hand painted scarfs, doilles, pillows. Extremely low priced. A wonderful new process. Our agents are cleaning up. Paintographs practically sell themselves. Write for full particulars of liberal agency offer and circulars describing Paintographs, Bradford's Paintographs, Inc., St. Joseph, Mich. Joseph, Mich.

TURN your spare time into deliurs selling Poinet Polishing Cloth that cleans all metals without liquid, paste or powder. Retails 25c. Our agents say it sells like "bot-cakes." Prove it yourself with free sample sent on request, F. C. Gate Co., 122 Edinboro St., Boston.

ONLY one sale a day means \$200 per month! Marvelous new adding mochine. Retails \$15.00. Work equals \$250 machine. Ads. subtracts, multiplies, divides, automatically. Computes feet and inches. Speedy, accurate, durable, handsome. Five-year guarantee. Offices. Stores, factories, garages, lumbermen buy one to dozen. A fortune for live agents. Write quick for protected territors and free trial. Lightning Calculator Co., Dept. F. Grand Rapids, Mich.

BIG Money Selling "Jiffy Tire & Tube Repair Kit." Contains 3 Self-vulcanizing Tire Shoes; Large Outfit Tube Patch; 3 Puncture seaiers, everything complete. Selfs to every nuto owner and Accessory Dealer. Agents average \$30 to \$100 week-Selfs to every nuto owner and Accessory Dealer. Arents average \$80 to \$100 weekty. We also manufacture Nationally known
"Jiffy Tire-Doh." Exclusive territory and
free samples. Chicago Tire Patch Co.,
347-65 E. 55th St. Chicago Tire Patch Co.,
but the sample of the self of the

AT Last! Diamond Rival Discovered!
Amazing blue white Rajuh Gem astomuls jewelry world and decrives experts! Resultiful Sample case Free! \$100 weekly! Write Quick! Rajuh Diamond Co., Dept. F-7, Sallshory, N. C.

WILLIAMS' No-Water Hand Soap., in tubes, has taken Auto owners by storm; washes dirtlest hands perfectly clean without water: easy demonstration makes quick sale. 150% profit. Williams Co., Dest. 265, Montelair, N. J.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

INSTANT Weld. Repairs largest punctures without cement or heat. Lemn's profit one day, \$56. Write quick. Free sample; territory going fast. Tourists' Pride Mfg. Co., Desk T., Minneapolis, Mion.

WE Pay \$50 a Week and expenses and give a Ford Auto to men to introduce boul-try and stock compounds. Imperial Co., D. 23. Parsons. Kans.

AGENTS—Make a dollar an hour, Sell Mendets, a patent patch for instantly mending leaks in all utensits, Sample package free, Collette Mfg. Co., Dept. 464, Amsterdam, N. Y.

\$60-\$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-D North Clark, Chicago.

AGENTS — Clever Invention! Inkapoon makes every pen a fountain pen. Fast office seiler; big profit, demand increasing everywhere. Exclusive territory offered, Sample free. H. Marui Company, Tribune Bldg., New York, N. Y.

POLMET—The Wonderful Polishing Cloth that cleans all metals without liquid, paste or powder. Approved by "Good Housekeeping" and "Modern Priscilla"—sells fast at 25c. Sample free. Gale & Co., Inc., 15 Edithborto St., Boston.

WASH Clothes the new way. Use the Torrent Automatic Washer. You will be delighted. Special offer to one in each locality. Storm Royalty Co., 3010 Enright Ave., St. Louis. Mo.

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fully profitable. La Derma Co., Dept. A, St. Louis. Mo.

BUILD your own Business! Free Valuable Literature explains how you can easily make your own Goods—bake others selling them. Miller, Chemist, 1700-A Jetton, Tampa, Fla.

AGENTS—\$240 a month. Take orders food flavors, tollet preparations, etc. Full or spare time. Build a tig permanent business. Must satisfy or money back. Write for free sample Outfit and offer. C. H. Stuart & Co., 5507 Main, Newark, N. Y.

MAIL-ORDER Houses and Distributors; We pack French made beauty creams, face powders, perfumes, toilet preparations with your label. Chemist, A2700 Wabash Ave..

Chiengo.

AGENTS—Here's a New One. "Bestever Powdered Hand Sonp." Sells like
wildfire. Marrelous Discovery. Removes
grease, paint, lnk, oil, in fact anything
from the hands. Cannot harm skip, 150%
Profit. Great Repeater. Agents simply
coining money, "Free Samples Get the
Business." Write immediately, Besterer
Products Co., 1945 E. Irving Park, Chiengo.

WINDOW Sign Letters, One Thousand for \$9.75 Beautiful design. Perfect out, Free samples, catalogue. Foil Sign Works, 822 W. 11th Street, Oakland, Calif.

AGENTS—Write for Free Samples. Sell Madison "Better-Made" Shirts for large Manufacturer direct to wearer. No capital or experience required. Many earn \$100 weekly and bonus. Madison Co., 566 Broadway, New York.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address. 25c. Stamping Outfits. Emblem Checks, Check Fobs. Name Plates. Hart Mig. Co., Desk. 2, 363 Degraw St., Brooklyn, N. Y.

ORIENTAL Perfumes bring 100% net profit, Good sellers and better repeaters. Romola Parfumerle, Inc., Woodlawn 10,

NEW Marvelous Self-Lighting Pocket Cigar and Gas Lighters, No Priction, Sells on Demonstration, Sample 25 cents, Rapid Mfg. Co., 798 Broadway, New York,

EVERYBODY Buys Davis' Nifty Toilet Goods Assortments. Useful, handsome gifts free to our customers. Over 256 high quality products. All repeaters. 100% profit. 25 years of success. Write! Davis Products Co., Dept. 56, Chicago.

AGENTS-\$60 to \$200 weekly putting up our Burnished Genuine Gold window letters; scripts. Experience unnecessary. Free sam-ples. Premier Letter Co., 121 N. Franples. Premier cisco, Chicago.

EASY, pleasant work for Mechanica, Shop-Men, Clerks, during space hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cuttery Co., 67 Bar St., Canton, Ohio. assured. Novel Canton, Ohio,

AGENTS \$1. Retails \$3. Your Profit \$2. Wonderful, pecket Adding Machine with Magic Writing Pad. Particulars Free. Typewriter Supply, 905 Hersch Bidg., Pitisburgh, Page 1997.

\$31.00 PROFIT—with \$1.50 Outfit—Big Money—Easy Work. Selling Gold Mono-grains for Automobiles, Luggage. Windows, Wagons. No Experience, No License. "Samples Free." Nullife Monograms. Hartford, Conn.

BUSINESS Guide with Free Legal Serv-

ree Soils everywhere; Wells cleared \$1,185 in 35 days. Write for free outfit. Nichols Co., Naperville, fit. Dept. 4B.

AGENTS make \$100 week placing advertising Clear Lighters with glass front. Every dealer wants one. Write for free plan. Drake Mfg. Co., Dept. M. Milwaukee, Wis. plan. Wis.

CALIFORNIA Rosehends selling like hot

CALIFORNIA Rosebends selling like hot cakes. Agents cointing money: new stuff. Big profits. Catalog free. Mission Factory PM. 519 No. Haisted, Chicago, III.

DUSTLESS Sponge Cloth. New Invention. (1) Rub—Dusts. Cleans and Polishes Automobiles, Furniture, Planos. Retails (56e)—Costs (16e). "Sample Free." Nulle Sponge, Hartford, Conn.

BIG Profits with Exclusive Territory—\$50 to \$100 weekly easy. More has often been made in one day's work. A hot or cold running water bath equipment for any home at only \$7.50. No plumbing or water works required. Investigate. Send no money. Write today. Sanitary Supply Co., 753 Alien Building, Toledo, Ohio.

\$20 PROFIT daily selling self-threading needles, needlebooks; cost 3-5e each; sell 25c; three samples 25c. Catalog free. Needlebook Specialty Co., 661 Broadway, New York.

AGENTS: \$300—\$500 monthly easy tak-

AGENTS: \$309-\$500 monthly easy tak-ing orders for Morey Rim Tool. Autoists and trade buy on sight. M. Morey Rim Tool Company. Blissfield, Mich.

BIG Money—fast sales; everyone buys gold initials for their auto; sell \$1.50, profit \$1,44. Ten orders daily easy. Samples, information free. World Monogram, Dept. 16, Newark, N. J.

AGENTS—N-R-G Laundry Tablets, the old reliable moneymaker for live agents, Millions sold—200% profit—sales waiting for you, Clothes washed spotlessly clean in 10 minutes without rubbing. Free samples, N-R-G Company, 230 W, Superior, Chicago.

GENUINE Gold Leaf Letters anyone can put on Store windows. Guaranteed to never tarnish. Large Profits, Enormous Demand. Free Samples. Write today. Metallic Let-ter Co., 438-A North Clark, Chicago.

AGENTS: Our gold-eyel Needle Cases are wonderful sellers; immense profits; \$50 to \$200 weekly; proof and particulars free; sample outfit 15c; factory prices. Paty Needle Co., 231 Davis Square, Somerville, Mass.

A BUSINESS of your own. Make and sell chipped glass name and house number plates, checkerboards, signs. Booklet Free, E. Palmer, Dept. 512, Wooster, Ohio,

EARN \$10 daily silvering mirrors, plating and refinishing metalware, autos, chande-liers, bedsteads, headilghts. Outfits fur-nished. E. Decie Laboratories, 1133 Broad-way, New York

AGENTS—Steady income. Large manufacturer of handkerchiefs and dress zoods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Credit given. Send for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, N. V.

NOW that you have read all these offers, read Macochee Company's (Cincinnati, Obio) advertisement again,

HIGH GRADE SALESMEN WANTED

WANTED—Tailoring Salesmen, make \$60 to \$125 per week. Biggest merchants in many towns have started with our line. We are the largest made-to-measure tailoring house in the country, furnishing claborate sample equipments, including 500 all-wood fabries. You make your own profits from \$8.00 to \$15.00 on each order. Guaranteed the other contraction perfect of thest work. ec. up to \$15.09 on each order. Guaranteed absolute satisfaction, perfect fit, hest workmanship, or no sale. Write for our line and all accessories to be sent free. Tell us all about yourself, Address N. O. Perry, Sales Manager, Rox 483, Chicago, Ill.

\$91.56 WEEKLY and up—Your Pay Dally. Introducing New 12 months Insured Hose for men, women, children. You write orders. We deliver and collect (or goods on credit and you can deliver, suit yourself). No experience or capital needed, Samules furnished. All colors, grades, including silks, listes, chiffons, heathers. Write outek, Marochee Textile Company, Card 3043, Cincipanti, Ohio. listes, chiffor Marochee Tex-ringati, Ohio.

WANTED: Salesmen to sell Toy Butloons and Squawkers to retail stores, \$200.00 per month easy. National Novelty Co., Gallon, Ohio.

SALESMEN, sell men's all wool suits tailered to order for \$29.50. Values to \$45.40. Fit and satisfaction guaranteed. Experience unnecessary. Our enable you to take measurements accurately. Earning possibilities \$75.00 up, weekly. Commissions advanced daily. Spring line now ready. Lee, Whiteup & Gollowier, Inc., Dept. S. 71 Fifth Avenue, New York,

DISTRICT Manager for Dr. Gelber's Pv-orrhea Hume Treatment, 160 Newark Ave., Jersey City, N. J.

WANTED: Salesmen to sell our Men's Wide Belts on 20% commission basis, \$200.00 per month easy. National Mailing Service, Galion, Ohio.

HERE'S hig money maker. Masterline Pocket Cigar Lighter; something new in specialty field; soils instantly upon demonstration to consumers and dealers. Sign (stamps) brings sample and selling plans, M. Masterlite Mfg. Co., 110 East 23rd St., New York. (Manufacturers well known Raido Gos Lighter.)

WANTED: Salesmen to sett Premiums

WANTED: Salesmen to setl Premiums to Bakeries and other merchants \$200.60 per month easy. National Premium Co.,

to Bakeries and other merchants \$290.00 per month easy. National Premium Co., Gallon, Ohlo.

12 PAIR Men's Pure Silk Hose cost you only \$1.00 on our co-operative plan. Approved by U. S. Suprome Court. Money back if disatisfied. Send \$1.00, stating size and rolor wanted. Conley Sules Co. Dep' F 186 N. LaSalle St. Chicago. III. SELL finest quality line Waterproof, high top boots and work shoes made in the country. We are the largest concern in this field. Write for new free sales Manual at once. Carson Shoe Co., Essex Station. Boston, Mass.

once. Carson rouse co.,

TIME-SAVER Rubber Half Soles becoming popular as rubber beels. Something new. Big seller. Quick money. Sell on sight all retail trade and direct. Outwear leather. Cost half. User attaches. No nails. Best season now starting. Write today for the Theesaver facts or send fortycents and pencil outline of shee sole for your pair if you want to get started at once. Timesaver Co., 771 Areade. Cleveland. Obio.

once. Timesaver Co., 771 Areade. Cleve-land. Ohlo.

SALESMEN — We will pay you well.

Hardenburg's famous line of Leather Goods,
Diarles. Calendars and other Advertising
Specialities. Product of forty-right years'
experience. Easy sales, satisfied customers,
big commissions. A serious offer for hustling salesmen. No canvassers. H. B. Hardenburg & Co., Inc., 413 Elizabeth Ave.,
Linden, N. J.

THE Improved Laminite Window Bulletin. Motion—Color—Light. Dignified, vet attention compelling, "Any sign any time" quick, easy, with our exclusive patented changeable letter system. Proof increasing merchants sales 160 to 200%. Liberal commissions, Protected territory. 20 minute demonstration often sells, Workers making \$100 to \$125 per week. World-wide distribution. Ask for evidence and sales plan, Display Products Company, \$18 Wyandotte, Kansas City, Mo.

ENPERIENCED Vacuum Cleaner Sales-men for a cleaner that can be sold to every bome. Responsible representatives are mak-ing \$500 to \$1,000 monthly. Past seller-sure repeater. Exclusive territory. The sure repeater. Exclusive territory, marvel Co., Dept. 74, Hammond, Ind.

THE Suleamen—Sell tires and tube direct from factory. Complete line, high quality, low prices, liberal counsission. Cable Rubber Co., Sandusky, Ohio.

SALESMEN-Get this big sensational, order-getting shirt outfit Free. Sell Stylemor Shirts all year round. It's Chicago's worder-gesting shirt outfit Free. Sett Style-mor Shirts all year round. It's Chicaco's Wonder shirt line. Advanced Spring showing of smartest, snappy patterns. Larce double swatches, low prices, nucles service, makes shirt selling easy. Betlard of Texas made \$16.00 in two days. We deliver and collect. Write today for hig free outfit, Stylemor, \$1 W. Yan Buren, Chicago, Ill. Dept. 1102,

A PAYING Position Open to representa-tive of character. Take orders shoes-hoslery direct to wearer. Good income. Permanent, Write now. Tanners Shee Mfg, Co., 1-410 St., Buston, Mass.

BECOME Your Home Town's Leading Business Mon. Big money. Easy work. Selling groceries, coffee, camed goods, autooils, men's shirts, ladies' hoslery direct to consumer. Undersell competition. Commission advanced. Liberal credit plan. ? perience or capital necessary. Lovel Browne Co., 1775 So. State. Chicago. Loverin &

SALES Manager for largest Eastern Tulloring House. To secure direct sales force. Superior line \$29.50 up, Extra trousers free. Large commissions: N. E. Wholesale Tailors, Harrison Ave., Boston, Mass.

DISTRICT Manager—Largest New England House. Suits, overcosts, \$23.50 factory to wearer. Largest commissions. Possibilities \$5,000 up. Boston Wholesale Clothing, 47 Beach, Boston.

SALESMEN: Write your name and address on a card and mail to us. We'll show you sure carnings of \$20.00 a day. Will you risk one minute and a one cent stamp against \$28,007 Mind you, we say we'll show you. Address Dept. 811, William C. Bartlett, Inc. Chicago. Inc., Chicago.

DISTRICT Sulesman; Must be reliable. Prefer married man, 30 years old or over and permanent resident. Exceptional opportunity for good man. Address Sales Manager, 844 West Adams, Dept. 213, Chicago.

MR. BRUSH Salesmen:—Old Established New York Brush Mamfacturer requires the services of men in all territories to sell their extensive line of Sanitary Twisted in Wire Brushes. We pay larger commissions than any other Brush House in the country. Write Immediately for our proposition, Wire Grin Sanitary Brush Corp., 15 Mercer St., New York.

SALESMEN: write for perticulars of an interesting and profitable business, selling

SALESMEN: write for particulars of an interesting and profitable business, seiling and operating aluminum refiliable salesboard, Square Hole Board Co., 120 Scheerer Ava.,

and operating aluminum retitlable salesboard, Newark, N. J.

BEST Seiler, Jent Rubber Repair for three and tubes; superseles volcanization at saving of over \$00%; put it on rold vulcanizes itself in two minutes; guaranteed to last life of three or tube; relis to every auto owner and accessory dealer. Get particulars how to make big money and free sample, Amazon Rubber Co., Philadelphia, P.a. Dept. 510.

\$50.00 DAILY Seiling Salesboards—Make up to \$33 on single sale setting largest, lowest priced line; no sample to garry; write for 3-rolor catalogue and full particulars. Lincoln Sales Co., Dept. E. 9 Se. Clinton, Chicago,

FALLORING Salesmen**: Our guaranteed \$23.50 and \$31.50 tailored to order suits are \$10 to \$20 cheaper than store prices; commission in advance; monthly bonus; protected territory; heautiful assortment \$23 swatches free. Our national advertising campaign makes selling easy—hig pencal business, DeLonge's record \$343 in one week. In one state alone 47 men average \$41.18 weekty. J. B. Simoson, Dept. 1174, 843 Adams, Chicago.

DISTRICT Agents—For Union Made nure wool suits and toncoats retailing at \$23.50, more higher. A remarkable line of 45 beautiful fabrics tallored by a large and well anown old established firm, sold only thru our own stores and district agents. A real opportunity for any good man. Big money to start and chance for advancement. We furnish large sale outh, 9x13 cloth samples. Men over 20 years of age with talloring or clothing experience preferred. Can use ambitious spare time men in smaller twens. furnish targe sale outh, 9x13 cloth samples Men over 30 years of age with tailoring or clothing experience preferred. Can use ambitious spare time men in smaller towns. Interested only in serious men who seek a future. Write for free samples and full information. Address M. V. Harvey. Mgr., Box 00. Chicago.

TAKE orders for coffee, sugar, flour, meats, canned goods, staple groceries; also paints, radio sets, tires, auto and tractor oils. No capital or bond required. We deliver and collect. Permanent business. Big pay. Write at once. Hitchcock-Hill Co., Dent. 50. Chicago.

SIDELINE—Good Commission. Printed Advertising Tying Tape: well introduced; sold to any line business; pocket samples. Nener. 75 Grand Street. New York.

SALESMEN Wanted. Necessary product, no competition. Rapid Sales Co., 687.4 Main St., Worcester, Mass.

SIDELINE Salesmen—The article eliminates automobile accidents; fast seller: over 400% profits. Sample free. Klear-Vu, 625 Bader Bidg., St. Louis, Mo.

SELL Men's High Ton Boots and Water-proof Quality Work Shoes Factory to Wearer. Our new sales manual will put you in the big earning class in twenty-four hours. Write for free copy today. Carson Shoe Co., Essex Station, Boston, Mass.

EASY Selling Specialty. Beautiful. Attractive, Appealing, Luminite Window Bulletin, Increase merchants' business 50%. East Station on each \$20 sale. Thousands being sold; sells itself on demonstration. Display Products Co., Ltd., 106 Gibraltar Bidg., Kansas City, Mo.

TRAVELING Salesmen calling on retail stores wanted by large manufacturor to sell unique line of business-boosting articles. Year round, fast selling, main or side line, I not earning \$150 weekly, address Union Specialty Works, Inc., 222 Charles St., Romeville, N. Y.

SALESMEN wanted in exclusive territories by an old established concern, to call on factories, Institutions, cemeteries and

Specialty Works, Inc., 222 Charles St., Romeville, N. Y.

SALESMEN wanted in exclusive territories by an old established concern, to call on factories, hospitals, achools, department stores, institutions, cemeteries and public buildings. Wonderful advertising co-operation. Proposition will pay from four in ten thousand a year to right man. C. B. Dolge Company, Westport, Conn., Sales Department.

YOUR trade uses salesboards. Make up to \$35 on single sale. Largest, lowest prized flue, No samples to carry. Elaborate 3-color catalog free. Limoin Sales Co., Dept. D. 2 So. Choton, Chicago.

IF You Think in Terms of \$6,000 the First Year write Us Now. Strong line for retail stores, Nationally advertised, Established concern. Best season new starting, Liberal weekly advance to producer. The Continental Co., 1922 Enclid, Cleveland, Ohio, Dept. 200.

Established concern. Best season now start-ing. Liberal weekly advance to producer. The Continental Co., 1922 Euclid, Cleve-land. Ohio. Dept. 200.

SELIS for \$0.75. Prints ad on wrac-ping paper, envelopes, etc. \$4.00 com-mission. Send 10c for sample work. Automatic Ad-Stamper, Joplin, Mo.

MEN Wanted—to sell dependable fruit trees, shrubbery, etc. Steady demand. Complete cooperation. Pay check weekly. Write Perry Nurseries, Dept. B. Rochester, N. Y.

N. Y.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money. Absolutely now. Big profits. Catalog free, Mission Factory SP, 519 No. Haisted, Chicago, IB, \$60-\$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberat affer to general agents. Metalile Letter Co., 428-B North Clark, Chicago.

SALESMEN Can make \$5.00 a day selling our Calendars, Penells, Signs, Advertising Novelties, Yardsticks, Whistles, etc. Liberat terms, Sells entire year. Fine side line. Local and traveling agents, Model Calendar Co., Dept. 226, South Bend, Ind.

FOUR \$1.50 sales to increhants net you

FOUR \$7.50 sales to merchants net you \$20.50 duity, Sayers Systems, 2803 Shef-field Ave., Chicago, III.

SALESMEN—Become Independent, Ovu-Your business, experience unnecessary sell-ing our \$7,500 Accidental Death; \$50 Ac-cident; \$25 Sick Weekly Benefits—\$12.50 Yearly, Other Amounts proportionate, Guaranteed steady income from renewalk, \$250,000 Deposited Insurance Department, Universal Policy, Dept. A, Newark, N. J.

HELP WANTED

WHY not sell us your spare time, \$2 an hour, \$19.70 daily easy for full time. Introducing New Style Guaranteed Hosiery for men, women, children, 57 styles, 40 colors, including silks, lisles, chittons. No canditate experience required. Just write orders, We deliver and collect. Your Pay Daily; also monthly bonus. Pree auto offer besides, We supply samples. Macochee Textile Company, Card 2603, Cincinnati, Ohio.

RAILWAY Postal Clerk, City Post Office Clerk, City Letter Carrier, Rural Letter Carrier positions highly desirable; obtainable only through competitive Civil Service Examinations. Highly helpful correspondence instruction for reasonable charge, Inquiries solicited. Federal Correspondence School, Inc., Kellogg Building, Washington, D. C.

BUILD solendid business making chinned

BUILD splendid business making chinned glass number and name plates, signs check-erboards. Write for particulars. Slamlex l'allity Co., 1133 Broadway, New York.

MEN, women wanting government post-tion \$1,700 to \$2,700 yearly, write Central Institute, Centralia, III.

10,000 APPLICANTS to operate Art, Gift Shops, Tea Rooms. Write for particulars. Unit Art Works, Dept. A2, 422 Lenox Ave., New York City.

HOTELS Need Trained Men. Nationwide demand for high-salaried men; past experience unnecessary. We train you by mail and put you in touch with big opportunities. Big pay, fine living, interesting work, quick advancement; permanent, Write for Free Book "Your Big Opportunity." Lewis Hotel Training Schools, Suite J-351, Washington, D. C.

IMMENSE Profits Silvering Mirrors at Home. Plating like new, brassy worm-off autoparts, reflectors, tableware, stoves, refinishing metalware, etc. We train von, Plans Free, Sprinkle, Plater, 77, Marion, 12nd

"UNCLE SAM" Wants You, Steady jobs, \$95-\$225 month, Sample examination coaching Free, Write Immediately, Franklin Institute, Dept. N-16, Rochester,

Franklin Institute. Dept. N-16, Rochester, N. Y.

QUALIFY for \$150—\$300 ralitond lobs, Fireman, Brakeman, Baggageman, Steeping Car or Train Porter. E16 Railway Bureau, East St. Leuis, Ill.

LOCOMOTIVE Firemen for ralitonds nearest their homes—everywhere; beginners \$150—\$250 monthly; promoted, locomotive engineer, \$3,000-\$4,000 yearly. Best naving positions on railroads. Railway Association, Desk Mi, Brooklyn, N. Y.

MEN, 18 up, wanting U. S. Mati Service positions, \$142 to \$225 monthly; steady; experience or correspondence course unnecessary; particulars free, Write P. Bradford, 112 N. 50th St., Philadelphia, Pa. \$35.00 WEEK. Bays—men, Learn Autorepairing, Sample lessons free, Franklin

\$35.00 WEEK. Boys—men. Learn Autorepairing. Sample lessons free. Franklin Institute, Dept. N-400, Rochester, N. Y.

ARE you old at forry! See our advertisement on page 153 of this issue. The Electro Thermal Company, 2137 Mgin St., Steubenville, Ohio.

Thermal Company, ville, Ohio, CET posted—good prices paid for butter-files, insects. See Sinciair display advertisement, page 42.

\$158 MONTH. Railway Postal Clerks. Men 18 up. 25 coached Free, Write immediately, Franklin Institute, Dept. N-16, Men 18 up. 20 c mediately, Frankl Rochester, N. Y.

66 MILES on 1 gallon—Scientific Gas Saver. All autos. Demonstrating model free. Critchlow, H-132, Wheaton, Ill.

U. S. GOVERNMENT wants men. \$1.709

\$\frac{1}{2}\$.900 and up at start, Railway Mail clerk examination coming. Let our expert (former Government examiner) prepare you for this and also Rural Carrier, Post Office, Customs, Internal Revenue, and other branches. Write today for free booklet, Dept. S. Patterson Civil Service School, Ruchester N. Y. Rochester, N. Y.

DON'T prepare for any Civil Service Examination without seeing our catalogue. Free. Columbian Correspondence Cotlege, Washington, D. C.

MAKE Money, silvering mirrors, refinishing but headlights, tableware; metal plating, bed steads, chandellers. Outlits furnished. International Laboratories. Dept. 11, 369 Pifth Ave., New York.

COMMENCE \$142-\$158 Month, Mail Carriers, Railway Mail Clerks. Men 18 uo. Travel—see country. Sample coaching—free, Write immediately. Franklin Institute. Dept. N-16, Rochester, N. Y.

WANT a U. S. Government Job? \$1,140 to \$3,000 year. Become Railway Mail Clerks. (Travel—See your country) Bural and City Mail Carriers, Post-Office Clerks, Clerks in Government offices. Steady work. Paid vacations. Experience unnecessary. Full particulars and sample coaching—free, write immediately. Franklin Institute, Dept. N-3. Rochester, N. Y.

WE need more men for Railway Ielegrapher service in and out of Chicago. No experience required. Day work. Salary \$20 to \$30 while in training. Call or write W. H. Dye. Supt. Room 1114, 159 No. State St., Chicago.

\$158 MONTH. Railway Postal Clerks. 25 coached Free, Write Immediately. Franklin Institute, Dept. N-16, Rochester, N. Y.

MEN Wanted—prepare as firemen, brakemen, colored train or sleeping cor porters, wire for application blank; experience unnecessary; first class roads, no strike. Name position wanted. Railway Institute. Dept. 35. Indianapolis. Ind.

MEN wanting forest ranger, railway mall clerk and other govt, positions. Write for particulars. Mokane, B-23. Denver, Colo.

BECOME a Landscape Architect. Uncrowded profession of wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Write for book. American Landscape School. 56-E, Newark, N. Y.

STEAMSHIP Positions—Europe. Orient.

book. American Manuscus, Nevark, N. Y.

STEAMSHIP Positions—Europe. Orient, Good pay. Experience unnecessary. No compulsory service. Send stamped addressed envelope for list. Box 30-X, Maunt Vernon, N. Y. or Box 336-A, Santa Mooica, Calif. \$115—\$400 MONTHLY paid—Ry. Station—office positions. Free passes, experience unnecessary. Write Baker, Supt., (ABT)

SILVERING Mirrors, French plate. Eas-y learned; immense profits. Plans free, ddress, Wear Mirror Works, Dept. 34, Address. Excelsior Springs, Mo.

wanting to ALL men-women, 18-60, wanting to qualify for Government Positions, \$140-8225 monthly, local or traveling, write Mr. Ozment, 161, St. Louis, Mo., immediately,

STORIES, poems, plays, etc., are wanted for publication. Good ideas bring big money. Submit manuscripts or write Literary Bureau, 522, Hannibal, Mo.

EARN \$10 daily silvering mirrors, plat-ing and refinishing metalware, auto, chande-ilers, bedsteads, headlights. Outfits fur-nished. E. Decie Laboratories, 1123 Broad-way, New York.

FINGER Print Experts—Excellent paying positions; particulars free. Finger Printed Headquarters, 188 East 79th, New York.

INVENTORS desiring to secure patents should write for our book "How to Get Your Patent," tells our terms and methods. Send sketch for our examination and Instructions without charge. Randolph & Co., Dept. 418, Washington, D. C.

MAKE money writing Photo-plays: de-its free to beginners. No correspondence urse. Producer's League, 230 Wainwright. course. Loads.

MEN wanting forest ranger positions, \$1,500—\$2,400 year, Write for free par-ticulars of exams. Mokane, B-21, Denser, Colo.

INFORMATION

ACCURATE, specific information on any one subject \$2. National Information Bu-reau, 316A Shepard Building, Grand Rapids, Mich. Prompt service, satisfaction guaranteed

ADVICE on any subject \$1.00. Universal Bureau. 3810 Enright, St. Louis, Mo.
AUTOMORILES: 753 ideas on repairing and improving, in Popular Mechanics three new books: Auto Repairman's Handbook, Auto Cwner's Handbook, Auto Tourist's Handbook, Send No Money. Just write a postal. Pay postmen the postage and \$1.50. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago, Ill.

BUSINESS SERVICE

BUSINESS Problems Solved—all kinds—huying, selling, financial, increasing business, advertising, getting men, getting nesitions, special formulas, processes, etc. Long business experience, thorough research complete tiles of information. Complete solution of problem \$5, particulars free. Satisfaction guaranteed, All confidential, National information Bureau, 316P Shepard Building, Grand Rapids, Michigan.

MAKE 'Em Pay—My system will make them pay their bilis. Write for the acid test. Literature free. Burleigh L. Horr. Horr Omelia Block, Rhinelander, Wis.

Horr Omelia Block, Rhinelander, Wis.

CHARTERS—Delaware; best, cheapert; free forms. Colonial Charter Co., Wilmington, Del. (99)

DELAWARE Incorporator, Charters; Fees Small; forms. Chas. G. Guyer, 901 Orange St., Wilmington, Del.

HAVE a Broadway-New York City office address. \$3.00 month. Mall forwarded daily. Ford's Service, 929 Broadway.

REPRESENTATION in Washington, D. C. Mail address, Information, Anything, Anytime. Service, 517 Kresge Bldg.

TYPEWRITERS AND SUPPLIES

UNDERWOOD Typewriters—only \$3.00 down, Easy monthly payments. Low prices at less than manufacturers. 10 days' free trial, Rebuilt, all worn parts replaced. Just like a new machine. 5-year guaranter. Write for a big free catalogue C-151. Shipman-Ward Mrg. Co., 1513 Shipman Bide., Chleago, III.

man-Ward Mfg. Co., 1513 Shipman Bide., Chleago, III.

TYPEWRITERS All Makes. Save One-half. Thoroughly rebuilt in our factory to the famous. Young Process. Fully guaranteed. Free trial. We handle all standard makes. Cash or sold on easy terms. Write for catalog. Young Typewriter Co., Dept. 5153, Chleago, III.

100 TYPEWRITERS Free. Overstocked. Rent rebuilt Underwood or Remington \$3.00 month. If you pay its value in rental, we give machine free. Particulars free, Pittsburgh Typewriter Exchange, 945 Hersch Bidg., Pittsburgh, Pa.

TYPEWRITERS. All Models, used and rebuilt, at lowest prices. Send for price list before buying elsewhere. We save you money. Big Money-Making Plans free with order. Keith's Supply House, Depf. A. Long Beanch, N. J.

Typewriters, atl standard makes. \$10 up. Fully guaranteed. Free trial. Write for complete filustrated lists. Northwestern Typewriter Exchange, 121 N. Francisco Ave., Chicago.

TypewriterExchange, 121 N. Francisco Ave., Chicago.

TypewriterS., Chicawriters. Adding Machines. Real bargains. Write for list. Earl Warring, Parkersburg, Iowa.

USED L. C. Smith \$5, 2 color ribbon—back spacer \$18.50. Used Oliver \$18.8 ay., 286 5th Ave., New York.

Typewriters—portable, standard. visible, \$2—\$35. Rent, Motorycles \$10—\$75. Knight, 1512 Locost, 8t. Louis, Mo.

Typewriter Ribbons of Quality Priced Right. Write. Midwest, Box 47. Spring-field, Ill.

TypeWriters—All Makes; Wonderful Values. Typewriter Bargain House, Ada, Okla.

PRINTING, ENGRAVING AND MULTIGRAPHING

TYPE, Rule, Border, Ornaments, Novelties, Leads, Sings, Multigraph Type. Highest quality, lowest prices, immediate shipment. Send for estalogue. Trade Monotypers, 702 Pennsylvania Ave., Baltimore, Md.

\$3.00 DELIVERED, 500 Watermarked Bond Letterheads, \$\frac{3}{2}\text{x}11\$, and 250 enve-lopes, money with order. Job Printing Specialty, National Printing Company, Goshen, Ind.

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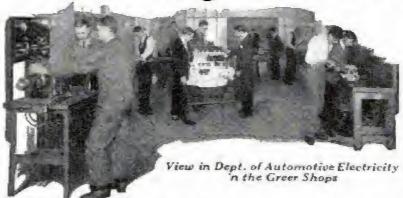
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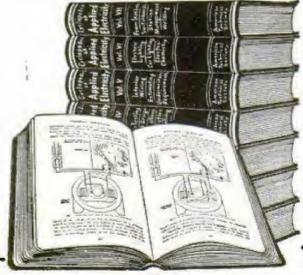
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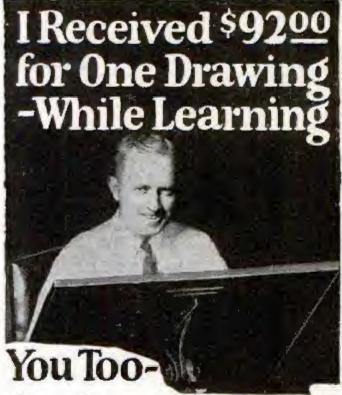
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A single trial will convince the most skeptical. Our legal, binding, money-back guarantee goes with each full treatment. If Tobacco Redeemer fails to banish the tobacco habit when taken according to the plain and easy directions, your money will be cheerfully refunded upon demand.

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ARTHUR AUGUSTINE. Plastering Contractor.

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myself in few days, having
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G. C. SAYLES.

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University of Applied Science 1920 Sunnyside Ave., Dept. 13-53 Chicago, Ill.

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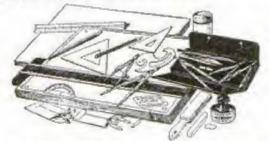
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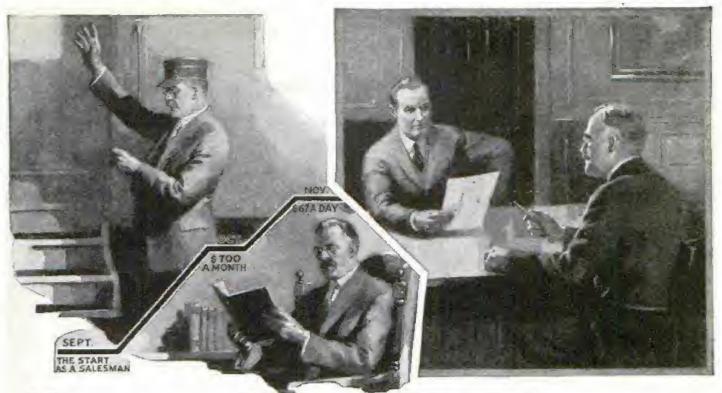
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The North American School of Drawing

and is Open to Everybody who likes to Try.

The only persons not allowed to compete are those who have had Drawings purchased.

are those who have had Drawings purchased by a newspaper or advertiser. This Competition is confined strictly to Amateurs.

PRIZES

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2nd Prize - 50 5th Prize - 10

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7th to 20th Prizes \$2.50 each

BEGIN NOW!

Copy this Drawing in pencil or pen and ink. See how well you can do it. Sit down and try. First of all read the Rules of the Competition. You can draw on any paper. Prizes will be awarded to the best drawings.

All drawings will be returned to the competitors at the close of the competition.

DON'T MISS THIS! SOMEONE WILL WIN THE \$100. WHY NOT YOU? Send in your sketch today.

Rules of the Competition

- Anyone is eligible to compete except employees of the North American School of Drawing and Professional Artists.
- All sketches must be mailed on or before March 1st, 1926.
- Only one sketch may be submitted by each competitor.
- The bottom left-hand corner of the envelope should be marked plainly —"Competition."
- Competitor's full name and address must be written on the back of the drawing, with State or Province.
- Sketches must not be drawn on paper larger than 8 in. high by 6 in. wide.
- 7.—All sketches will be returned to competitors at the close of the competition, together with a list of the prize-winners. The North American School of Drawing cannot be held responsible for any sketch which may be lost in the mails or elsewhere.
- Sketches must be accompanied by a Post Office or Express Money Order for 50c (fifty cents) in return for

which each competitor will receive an illustrated specimen lesson from the course of instruction issued by the North American School of Drawing, which will be sent with the results of the competition. Please do not send stamps or coins.

9.—Sketch and money order MUST BE SENT IN THE SAME EN-VELOPE. Competitors are patricularly requested NOT to send their sketch in one envelope and money order in a separate envelope.

- Sketches received insufficiently stamped will not be accepted. All packages should be scaled and bear letter rate of postage (2 cents for one ounce).
- Competitors agree to accept the decision of the Artists of the North American School of Drawing as final and conclusive.
- 12.—In the event of a tie for any prize offered, the full amount of that prize will be awarded to each tieing contestant.

13.—The North American School of Drawing reserves the right to purchase any sketch submitted. Any sketches purchased will be paid for at the rate of \$10 (ten dollars) for each sketch.

The North American School of Drawing

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"That sounded like a good proposition, so I began studying with the International Correspondence Schools. It changed

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course and prepare to earn more money."

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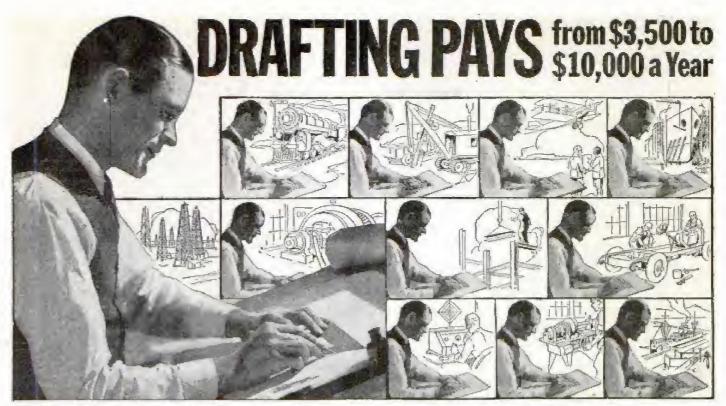
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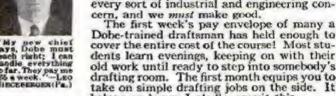
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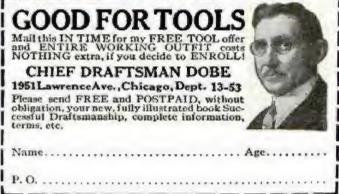






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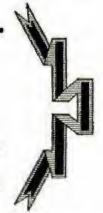
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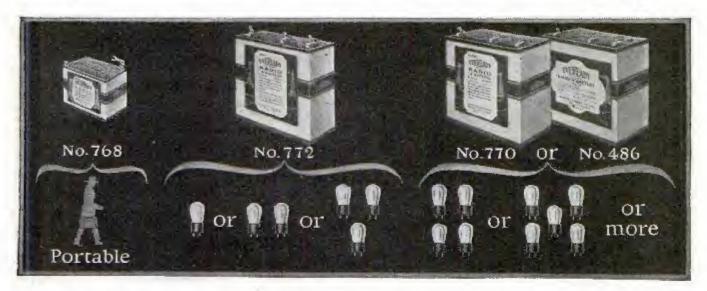
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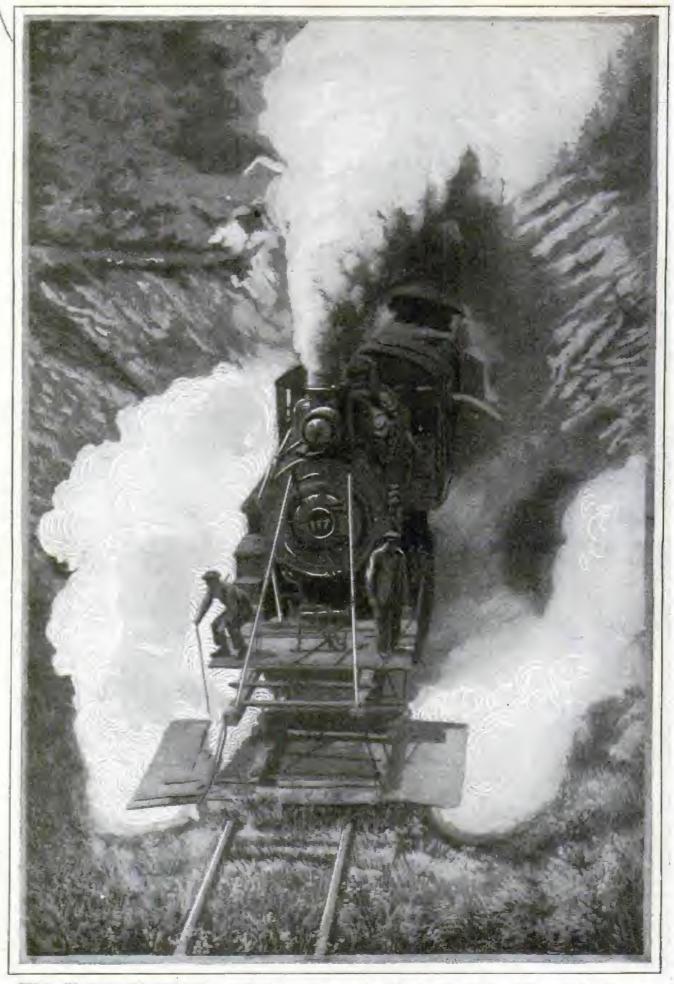
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Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 45

MARCH, 1926

A World without Pain? Than

Goals of Longer Life, Freedom from Disease and Painless Treat-

A NEW anaesthetic, twice as powerful as ethylene, sure in its action, and swift in permitting recovery, since full consciousness returns within a minute after the flow of gas is stopped, is science's latest discovery in the fight to bandish pair.

The new anaesthetic, called propylend, is produced from ordinary artificial gas, and besides its other features rarely produces any after sickness or nausea. In fifteen major operations only one patient

was rendered sick by the gas.

With the normal span of life steadily growing longer as one after another of the mass diseases have been conquered, scientists are confident that in the next half century they will add another twenty years to the average life, bringing it well up to four score years. What this means may be realized when statistics of the past are studied. In the sixteenth century the

average life span was but twenty years the ripe old age of those who grew up being more than offset by the appalling infant mortality due to lack of knowledge children's diseases. At the close of the eighteenth century the average was still less than twentyfive years. A hundred years ago, in America, it had reached thirty - five years; by 1870 it was forty-one

years, and in the fifty-six years since it has almost reached sixty years.

With the exception of occasional sporadic pests, such as the influenza epidemic which swept away 22,000,000 lives during the war, man has virtually ceased to die from mass complaints, and now dies an individual death, due to breakdown of his own body machinery. Vaccines, toxins and anti-toxins, as well as better medical training, have conquered smallpox, diphtheria, measles, and the myriad diseases that in the Middle Ages claimed a vast proportion of the population in the years of infancy and childhood.

With the individual death from personal troubles replacing the mass diseases, the perfection of medicines and anaesthetics—the latter less than 100 years old—takes on renewed importance, since they deal with the treatment of the individual. The ancients knew how to use drugs made

from the poppy, belladonna, mandrake, solanum, mandragora and nepenthe to produce unconsciousness, and back as early as the third century Chinese record the use of hemp physicians for this purpose, but theyo never became general and major operations continued to be performed more often than, not without anything to relieve the pain. The sleep-producing qualities \(\)

wee 1924 0: 485



Treating a Workman in the X-Ray Laboratory of an Industrial Plant; Such Hospitals Are Helping Kee, Employes Healthy

Cont.

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ma





Top, Taking Blood Specimens for a Test; Center, Treating Yellow - Fever Bearing Mosquito Breeding Swamp, and Below, Microscopic Diagnosis to Isolate Disease Germs

of ether were discovered in the year 1800, but were not put to any practical use for half a century, while it was not until 1847 that chloroform was first used by a physician. The mod-

ern science of the cure and prevention of disease did not come into being until still later. Medicine and surgery have been revolutionized in the last thirty years, all with the idea of preventing pain and of prolonging life. Anthrax, cholera, dysentery, hookworm, yellow fever, malaria, leprosy, meningitis, bubonic plague, pneumonia, lockjaw, tuberculosis and typhoid, to mention only a few, have yielded to treatment, to preventive measures, such as the elimination of the mosquito-borne yellow-fever germs, and, through isolation of all their germs, have been, or are being conquered.

Now that science has virtually completed that phase of its work and is turning to the personal diseases, to heart trouble, diabetes, rheumatism, hardening of the arteries, and the host of bodily and mental complaints, an entirely new theory of life

is being developed. Physical examination at stated intervals, preventive medicine, supervised recreation, and other developments are paving the way for the anticipated further extension of life. The chief troubles of the human race are due to the complicated, multi-cell structure of the body. If the human body had but one cell it could be immortal, as one-celled forms of life are. A paramecium, which is composed of only one cell, has been cultivated in the laboratory by Dr. Woodruff for a period corresponding to 8,500 of its generations, and the 8,500 generations of this one-celled life form correspond to approximately a quarter of a million years in the life of a man. Dr. Alexis Carrel, back in January, 1912, took part of a chicken's heart and began growing it in his laboratory. It is still alive after a

little more than fourteen years and growing so fast that it must be divided daily.

Natural death the personal and individual death which overtakes man in old agecame into being as a result of the evolutionary processes which intervened between the original one - cell life and the multi-cell organism which is the human body today. Death, scientists hold, is not a

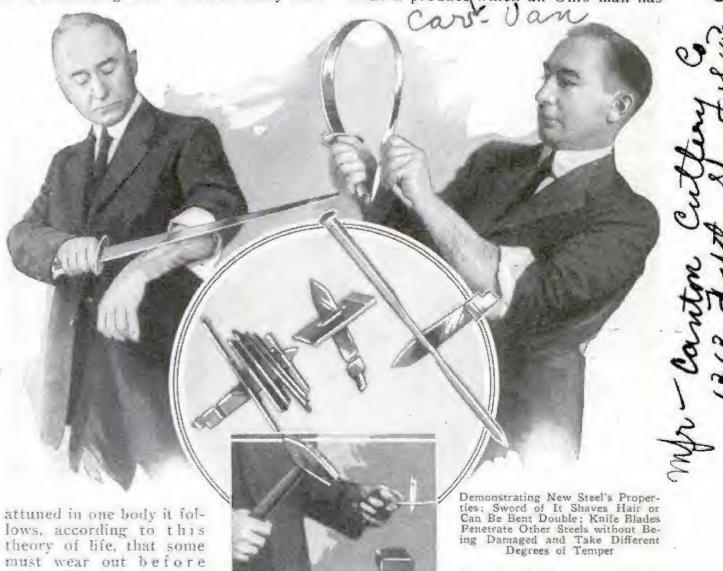




necessary attribute or consequence of life, and life can and does go on without death. When the multicellular human being does succumb he is merely paying the price for the privilege of enjoying a more complex and interesting life. With so many cells

NEW STEEL HARD YET PLIANT, TAKES RAZOR EDGE

Many of the qualities of the celebrated Damascus steel are said to be found in a modern product, which an Ohio man has



others, just as one part of a motor car will give out

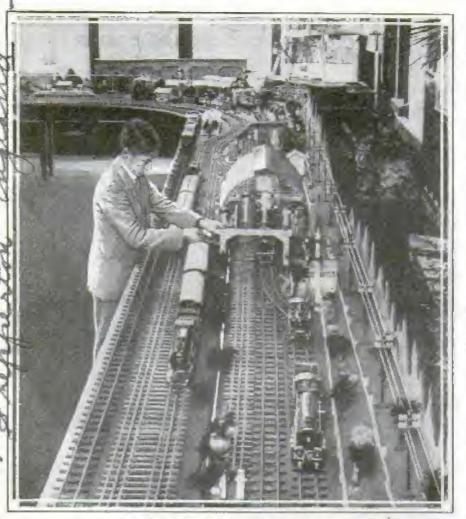
first, and upset the working of the whole machine. When that happens to the body, if the part involved is the carburetor, or heart, the machine will stop as quickly as a motor car with a similar complaint, or if it is one of the other vital parts, an equally serious breakdown occurs, while some minor failure is accompanied by a correspondingly minor, or serious, form of disease,

It is here that modern science has begun to play the part of garage mechanic to repair and replace the worn-out parts. As the mechanics become more successful, the life span grows. The time is not so far off, according to the doctors, when the man who dies before seventy will be either the victim of an accident, or personally to blame.

developed by a secret process. He combines iron and

carbon in such a way that the resulting steel will bend, keep an edge of razor sharpness, is tough and can be driven through other steels without breaking. A bar of the material, fifteen inches long, was tempered to five different degrees, one end of it being hard enough to cut glass, a section was sharpened like a razor and would cut dry hair without honing or stropping, while other parts in the same bar would cut off a spike under blows of a hammer, would spring or could be bent backward and forward with the thumb and forefinger without breaking. Vanadium is an important element used in the preparation of the steel.

• A day in China is divided into twelve parts of two hours each.



Model Railway System Has Four Main Tracks Besides a Subsidiary, and Its Locomotives Are Run by Steam, Electricity or Clockwork

MODEL OF RAILWAY SYSTEM HONORS INVENTOR

For the entertainment of his grandsons and to honor the memory of Richard Trevithick, who preceded Stephenson by several years with the invention of England's first passenger locomotive, a British statesman has erected a complete model railway system. It includes 550 feet of rails, four main tracks and one subsidiary, seven model locomotives, and numerous stations, bridges and other equipment. Two of the lines are for electric, one for steam and another for clockwork-driven trains. On Christmas eve, 1801, Trevithick's locomotive hauled the first load of passengers ever conveyed by steam.

SEEK WAY TO USE SUN'S HEAT WITHOUT PRODUCING STEAM

Success in harnessing the sun for industrial purposes will probably come, not by turning its heat into steam but by finding some way whereby to convert the heat energy directly into power or to make substances which will produce power, according to W. B. Parsons, an engineering—

authority. He points out that one of the most successful steam plants operated by the sun was capable of running only a small engine with an over-all efficiency of less than five per cent. It was constructed in Egypt in 1913 and had a heat reflecting surface of 13,269 square feet. Only lowpressure steam could be developed. Considering the sun as a source of power, it is estimated that each square foot of its surface exposed to the earth, some 585,750 millions of square miles if projected flat, radiates sufficient heat to generate 12,500 horsepower. Only a small portion of this total energy reaches the earth as most of it is scattered into space, but, theoretically, an acre of sunlight during the noon hour on a clear day at sea level would furnish over 5,100 horsepower-hours. Assuming that there are nine hours of maximum-

intensity sunshine each day and that onehalf of the energy is recoverable, a strip of land ten miles wide and 100 miles long would daily develop 14,700,000,000 horsepower-hours. On a fifty-per-cent basis of efficiency, enough sunlight falls on the Great Salt Lake to produce energy equal to that furnished by the whole annual world consumption of fuel.

DESIGNS ON SWITCH PLATES HARMONIZE WITH ROOM



Decorated electric-switch plates to replace plain, ones, are intended to blend with the wall paper or color scheme of rooms. The finish is baked on so, that it cannot readily tarnish.

wear off or fade. The plates can be in stalled in a few moments.

(Nearly half a million persons make their homes on the desert sands of the Sahara.

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POPULAR MECHANICS 357

Scooting over the Ice on a Trial Spin, the "Airplane" Boat Developed a Speed of Seventy-Five Miles an Hour and Was Turned in a 100-Foot Circle at Forty Miles

NINETY MILES AN HOUR !

Ice is seen as an ally of the air for army service as a result of the invention, by a civilian employe at McCook field, of an iceboat with a body like the fuselage of an airplane. It is capable of making a speed of ninety miles an hour, its propeller is driven by a motorcycle engine and the framework, cockpits and control system are patterned closely after those of a plane. The rudder is a rear runner which may be operated by a steering wheel near the back, but is also connected to the control apparatus in the forward cockpits. The bottom of the boat is waterproof and will remain afloat with three passengers should the ice break. Runners are of carbonized steel and are attached in such a way that they act as shock absorbers. Because of the limited space available during tests, the craft has not been driven at more than seventy-five miles an hour. It can turn in a 100-foot circle without danger while going forty miles an hour.

SILK PATTERNS SENT BY CABLE KEEP WOMEN IN STYLE 0 3

Women in Los Angeles need not be more than twenty-four hours behind their sisters in Paris in the matter of the latest patterns in silk. The designs are now cabled across the ocean from France to manufacturers in California who are waiting with the raw silk on the looms. Just a day after a new pattern appears abroad, it can be purchased across the counters of a department store here. Since 1915, when

silk culture was first started in California, more than 220,000 mulberry trees have been set out and millions of silkworms put to work. It is said that a larger amount of silk is obtained from cocoons in California than in the Orient, as the growing period for mulberry leaves is about two months longer. Between 400 and 600 yards of silk are recoverable from a cocoon in China and Japan, while, in California, the amount is from 1.000 to 1,000 yards.

BARS ON WINDSHIELD VISOR DEFLECT RAIN AND SNOW

Two or four bars, set horizontally below the automobile windshield visor, are set to keep rain and sleet from striking the glass and are far enough apart so that the driver can see between them. They may



Ribs below Windshield Visor Keep Off Driving Rain or Snow, Eliminating Need of a Wiper

be raised out of the way when not in use or, if desired, help keep the glare of the sun from the eyes. With this arrangement, a windshield wiper is not needed. 9 9 S POPULAR MECHANICS Equipment at Radio Station WJZ; Some of the Ten-Kilowatt, Water-Cooled Tubes, and Below, One of the Short-Wave Antenna Masts with Coil in Center Huge Water Cooler to Supply the Tubes Big Vernier Condensers of the Transmitter Set Have Small Electric Motors to Turn Them; One Is Seen above Operator's Hand; Because the Station Can Be Sharply Tuned, Interfer-ence Is Reduced, Experiments Have Shown

FIFTY-KILOWATT RADIO UNIT LATEST WIRELESS MARVEL

Radio's astounding development in the last few years is reflected in the equipment

Brook, N. J. a fifty-kilowatt unit that is expected to span great distances and also overcome much of the static and other stray noises that bother the radio fan. The station's apparatus includes sixty - four ten - kilowatt tubes, all of them watercooled. A tank that has a capacity of cooling 100 gallons of water a minute has been constructed for this purpose. The condensers are operated automatically by small electric motors. Coils of the short-wave antenna. which will broadcast on seventy meters, are exceptionally rigid and are made of copper tubing of the same size as the aerial itself. 1053

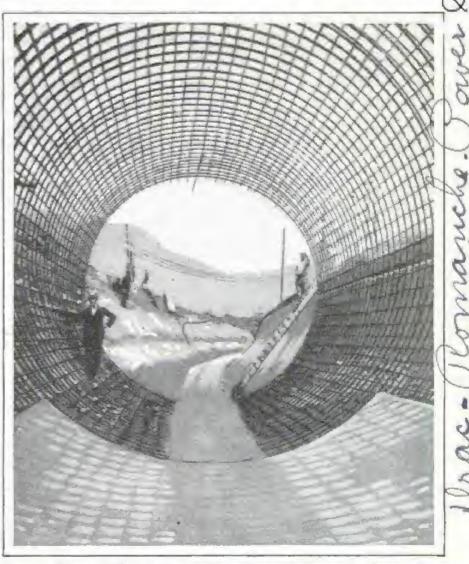
DUST EXPLOSIONS KILL MANY

Dust explosions and fires resulting from them. killed forty-five persons, injured twenty-eight and did approximately \$3,-000,000 property damage in the United States during the past year, according to an associate of the

government chemistry bureau. There are 22,000 establishments in this country that handle dusty products, or that manufacture articles likely to give off dangerous dust. Investigation by the bureau of chemistry has shown that practically all combustible dusts, and some not considered combustible, will explode when mixed with the proper proportion of air and ignited by a flame or spark. common source of such accidents lies in hot bearings, while it has been shown that static sparks can ignite dust. According to an authority of the bureau, no record of a spontaneous dust explosion has ever been obtained. Prevention of the formation of dust clouds in factories and the elimination of all sources of ignition, are urged as ways of avoiding explosions.

BIG ARMORED CONCRETE PIPE SUPPLIES WATER POWER

What engineers consider a remarkable example of reinforced-concrete construct of broadcasting station WJZ at Bound tion is represented in a huge conduit, near



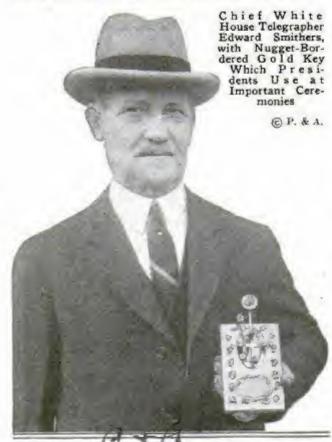
Concrete Pressure Pipe tor French Water-Power Station under Construction; besides the Reinforcing Ribs, an Earth Filling Adds Strength

Grenoble, in the French Alps, constructed for a power station. The pipe has an internal diameter of nearly nineteen feet and will handle pressure of a column of water under a head of from twenty-three to forty-six feet. It will utilize the flow from two rivers which have a combined volume, in the spring months when the snow is melting, of more than 7,000 cubic feet per second. A gravel chamber has been constructed to free the water of pebbles before it enters the intake canal leading to the power house. Besides being ribbed with a network of supports, the concrete pipe is further strengthened with a thick earth filling over the top.

The United States now has approximately 52,000 towns and post offices.

TELEGRAPH KEY OF SOLID GOLD OPENS GATES AFAR

"The president will flash the signal for the opening of the ceremonies by press-



ing a gold telegraph Rey in the White House." News dispatches have often in News dispatches have often included such a phrase and the gold key has come to be one of the most important implements in national affairs. With it, the Pacific exposition Alaska-Yukon opened in Seattle, Wash.; President Wilson touched it to blow up the Gamboa dike of the Panama canal, and it has figured in many other events that happened thousands of miles from Washington. The key is mounted on a slab of Alaska marble and is studded with a score of gold nuggets. It was given to Edward Smithers, chief telegrapher at the White House, by President Taft, in 1909.

HUGE LOST STATUE OF LINCOLN O PLACED IN CHICAGO PARK

After years of obscurity in a warehouse, a heroic-sized bronze statue of Lincoln, by St. Gaudens, has been placed on a granite base in Grant Park, Chicago. The piece, which shows the figure of the great president seated, was finished in 1906. Nine years later, it was shipped across the country for exhibit at the San Francisco fair, and the following year was returned

cano

to Chicago. While plans were being made for its permanent display, it became temporarily "lost," to the public at least, until interest was re-aroused in it by newspaper and other publicity. The statue was considered by St. Gaudens the best he ever made of Lincoln.

SALMON ARE ABLE TO TRAVEL HUNDREDS OF MILES A WEEK

That salmon travel amazing distances in short periods is indicated by the journey of one fish which was liberated at the southern end of Nova Scotia last June and was caught less than a month later in the Moisie river, Quebec. Identification was made by means of the silver tag which had been placed in one of the salmon's fins when it was first captured. Its journey was between 800 and 1,200 miles long. Fish movements are important where the fishing industry is highly developed, and by means of the tags, valuable knowledge is being gained as to the habits of salmon and other fish.

NON-SKID PADS FOR HORSES HELP PREVENT ACCIDENTS

Pads of woven material, which may be quickly inserted within horses' shoes, have been devised by a former British army captain to keep the animals from



pocket and no tools are necessary when fitting them. They are said to afford such a secure footing that horses can be ridden over ice with little danger of falling.

no further information

Hunting Mountains under the Sea

Ranges and Valleys Never Seen by Man Are Named and as Well Known as the Peaks and Plains of the Continents

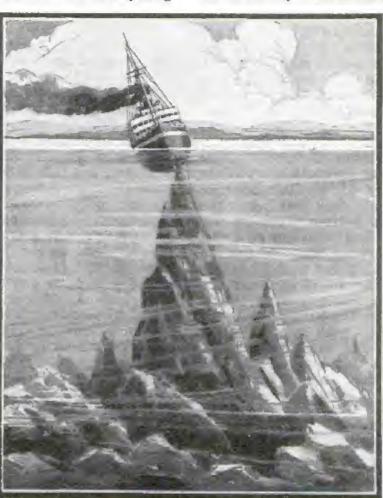
OFF the western coast of Africa lies the Congo Canyon, bigger and deeper than the Grand Canyon of Arizona, and more strangely beautiful, but no man has ever seen its depths, and it is improbable that any man ever will. For the Congo Canyon is at the bottom of the Atlantic, one of the vast valleys between the giant mountain peaks whose tops fail to break the surface of the sea, and so remain unknown to all but the hydrographers who plot the mystery land under the waves.

Out in mid-Atlantic is a tall and stately peak named, for some forgotten reason. Mount Laura Ethel. Put it down in the midst of the rockies and it would tower up with the best of them, but because its highest point falls just a few score fathoms short of reaching sunlight, thousands of transatlantic passengers each year sail over the hidden mountain top without ever knowing it is there. To the hydrog-

rapher who constructs the marine charts of the world virtually every part of the ocean floor has its name. To him it is a land of hills and valleys, plateaus and yawning canyons. There is the Telegraph Plateau, half as big as Europe. yet appearing on the maps of no school geography. It lies beneath the North Atlantic, between Ireland and Newfoundland, and because its vast plains are so level and so close to the surface, it made the laying of the first

Atlantic cable possible. Then there is the Crozet Rise, the Japan Trench, the Cape Trough, the Marianne Ridge, the Brazil Basin, the Tuscarora Deep, and a vast mountain chain, known as the Edward VI range, to name but a few of the famous lands beneath the sea. The latter mountains, lying in the North Atlantic, have only recently been added to the underwater geographies, for vast stretches of sea remain to be charted. In 1901, the British cable ship "Britannia" discovered an entire new mountain chain in the South Pacific.

When one of the undersea mountains bursts through the surface and becomes an island it gets on the everyday land maps. The Bermudas are merely the tops of a mountain chain whose peaks rise almost straight from immense depths. St. Helena, where Napoleon spent his last years in exile, is another mountain top, as is lonely Ascension island. Off the



An Undersea Mountain, Projecting to Within a Few Feet of the Surface, Is a Trap for Every Ship Until Charted and Marked

Kuril islands. the bottom drops sheer to a depth of five miles. Similar yawning depths adjoin Guam, the mid-Pacific naval station of the United States, and the Philippines. Only a mile or two off the coast of Porto Rico, the mountain of which the island is the top drops almost straight down for 27,366 feet. Charts of the ocean depths have been prepared for many years. The first of the Atlantic was made in 1854 by Matthew Fontaine Maury, the famous American



Officers Making Magnetic Declination Observations Aboard the Non-Magnetic Schooner "Carnegie"

It was he who named oceanographer. the Telegraph Plateau. In recent years survey ships have constantly been at work adding new knowledge on which the shipping charts of the world may be based. The compass ship "Carnegie," of the United States, built without a piece of magnetic metal on board, has revolutionized the magnetic charts of the oceans; United States coast and geodetic-survey ships, with new methods of sounding, have mapped the bottoms, and with a wire drag have located many of the isolated rock pinnacles which lie in wait just below the surface to rip the bottom from an unwary ship. Radio has been put to work, and by flashing a sound wave to the sea bottom and listening for the returning echo, a ship plowing ahead at full speed can make accurate depth charts. Water bottles have been perfected to open at any desired depth and fill with samples of the water, and new nets are trapping the strange marine life that browses through the hidden mountain valleys far below the surface of the oceans.

The results of the constant study of the earth under the sea as well as the interior under the land above sea level are expected to have an important bearing on the further knowledge of earthquakes and their causes, the distribution of metals, oil and other valuable minerals, and solve the mysterious movement of the earth's crust. More than 5,000 earthquakes are recorded each year by the many seismographs in use throughout the world. Only comparatively few are strong enough to be felt by man, yet every day there are many minor quakes recorded only by the delicate needle in some laboratory. Scientists hope that, with the completion of accurate surveys of the entire undersea world and a computation of the distribution of its mass, they can, by studying the quake reports, solve the relation of small temblors to large ones, and perhaps learn to predict the imminent arrival of

destructive quivers. There are no "everlasting hills." despite the poet's phrase, according to Dr. William Bowie, chief of the division of geodesy of the United States coast and geodetic survey. earth, notwithstanding its mass and rigidity, is as plastic as soft putty under the stresses and strains of gravitational force. Islands and continents drift across it, so slowly that measurements a century apart may show a dislocation of only a .. few feet, but the movement does exist. Some time ago it was reported that America had moved a few feet westward, the distance from Europe being lengthened by so much. At first the theory was advanced that the drifting of the western hemisphere was in some way connected with the stresses due to the earth's rotation, but as other bodies, notably the island of Corsica, have moved eastward, it is now believed that a readjustment of the earth's interior has caused a general shifting of the surface.

The surface movement is determined by thousands of observations of the stars made

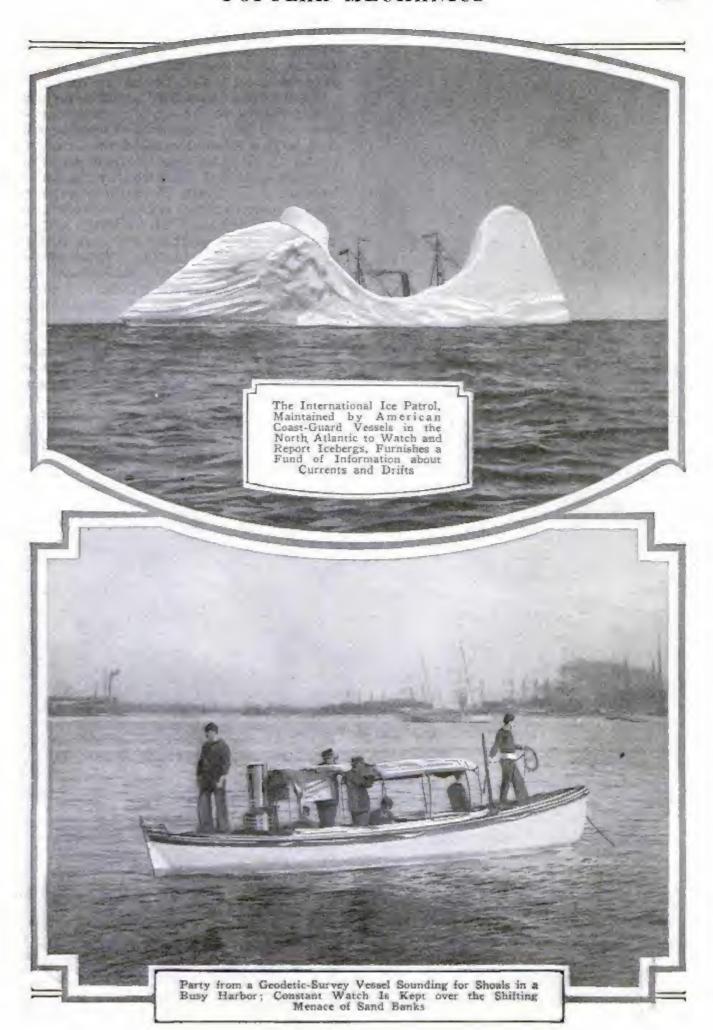


Mountain Ranges of the Pacific Ocean Whose Tops Project Above the Sea and Are Known as Islands; East of the Philippines and Guam Are Two of the Deepest Canyons in the World





POPULAR MECHANICS



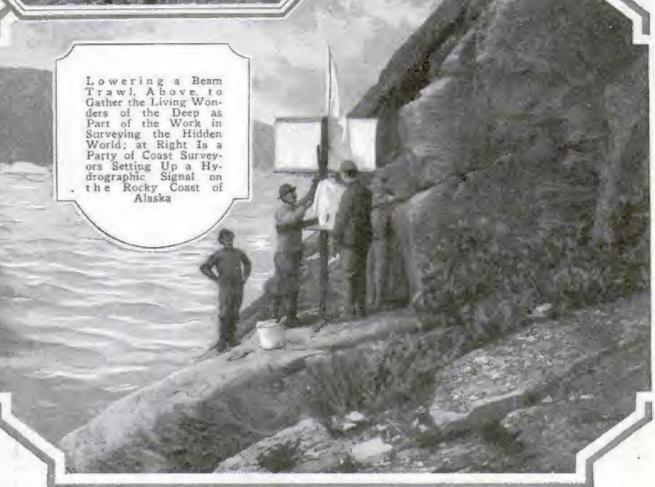
POPULAR MECHANICS



explosion to burst out on the sea bottom, several thousand feet nearer the scene of trouble, than on land above sea level, since the crust under the sea is weaker.

Much of the credit for the development of the theory of the earth's crust, composed of different materials so distributed as to be in a state of equilibrium, belongs to the U. S. coast and geodetic survey. The idea was first advanced by an Englishman, J. H. Pratt. more than seventy vears ago, but was not taken seriously until C. E. Dutton, in 1889, delivered a lecture on it in Washington and named the theory "isostasy," meaning "equal pressure." In the nineties, G. R. Putnam, of the geodetic survey, undertook to prove or disprove the theory by establishing gravity stations at several points over the United States, and decided that the crust under this country was in substantial equilibrium, with the reservation that mountain ranges possibly were supported as an extra load.

Later investigations by J. F. Hayford, Dr. Bowie and three mathematicians of the 'survey determined that the entire



earth's crust, extending for some sixty miles below sea level, was in almost perfect equilibrium, and that even the added weight of mountain ranges was compensated for by lighter material under them,

a fact that may in part explain why volcanic eruptions on land occur usually in mountain peaks rather than in the denser mass of the low lands.

If the earth's surface were cut up in hundredmile-square blocks, to the depth of sixty miles -the thickness of the crust-the separate blocks would weigh so nearly the same, the scientists have decided, that they would float side by side without change of level. The theory can be demonstrated by cutting blocks of metals of different specific gravity to the same cross-sectional area, but allowing sufficient height so that all will weigh the same, and then floating them in a

basin of mercury. Despite the difference in size, they all would float to the same depth, so their bottom surfaces would be in line, while the tops would stand out at irregular heights. Lead and silver, two of the heavier metals which will float in mercury, would be represented by shorter blocks as compared with nickel, copper, cast iron, zinc and antimony,

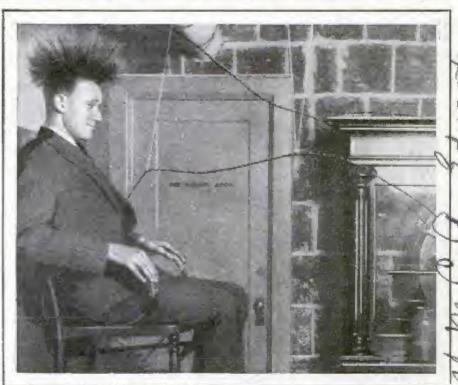
ELECTRIC MATCH LIGHTS PIPES, CIGARS OR CIGARETS

Pipe smokers as well as devotees of cigars or cigarets are served by an electric lighter with the heating element passed over a knob that fits inside the pipe bowl. Either direct or alternating current can be used from a lighting circuit and is turned



on by pressing a button on one side of the holder. The stand is eight inches high and has a broad and heavy base prevent tipping. STUDENT HAIR-RAISING STUNT SHOWS STATIC'S POWER

Static electricity is capable of other queer antics than causing howls in your



He May Have Been Frightened, but Fear Did Not Lift His Hair; It Was Static Electricity from Generator at Right

radio set. At a public exhibition in Portland, Oreg., current from a static generator lifted the hair of men students who sat in chairs near by, giving a realistic imitation of what sometimes happens in registering sudden and intense fear. When the test was tried with young women who had bobbed hair, the results were not so pronounced. Their hair straightened out but did not stand up, possibly because it had been kinked by waving or similar treatment.

ANNUAL COST OF SMOKE IN U. S. SEVEN DOLLARS PER CAPITA

Damage to property by smoke and soot in America's greatest cities costs the public about seven dollars per capita each year, according to estimates prepared by the United States bureau of mines. Be sides this loss, there is the economic waste of burning coal by inefficient methods, and health authorities point out the menace of a smoke-laden atmosphere. In England, plans have been made for the building of 100 demonstration homes which will be heated and lighted by gas and electricity. Records will be kept of the maintenance costs of these houses, for comparison with dwellings that use coal

port. 30 Charof &

POPULAR MECHANICS

DANCE ON GALLOPING FLOOR
TESTS COSSACKS' SKILL

One of the features of a recent Cossack show in London was a dance performed



Sby two men who were supported upon a platform on poles carried by horsemen. The uprights were fastened to the stirrups and were steadied by the riders as the horses galloped along.

PEDAL FOR AUTO ACCELERATOR ADDS TO DRIVING COMFORT

Leg strain, foot burns and damage to the floor of the car are prevented in a

pedal for the auto accelerator to rest the driver's foot. It can be adjusted to fit persons of different height, is easily installed and consists of tew parts. A steady pressure can be exerted



with it and chance of accidental contact with the accelerator is less likely. The pedal has rubber inserts to protect the shoes.

SEARCHLIGHTS FOR LIFEBOATS

In the excitement of shipwrecks at night, lifeboats not infrequently capsize, collide or are run down by steamers. To reduce these dangers, a London firm has

devised a special electric searchlight for use on motor-driven boats. is equipped with silvered reflectors, a powerful gas-filled type of bulb and has a carriage to alter the range of the light swiftly. By a single turn of a switch at the back of the lamp, the longrange concentrated beam may be changed into a close-range diffused illumination but the central core of light shines undimmed while the change is being made. Besides the searchlight, the boat is also pro-

RADIO-TUBE PHONE

for easy handling.

vided with a radio outfit. Controls for the different units are closely grouped

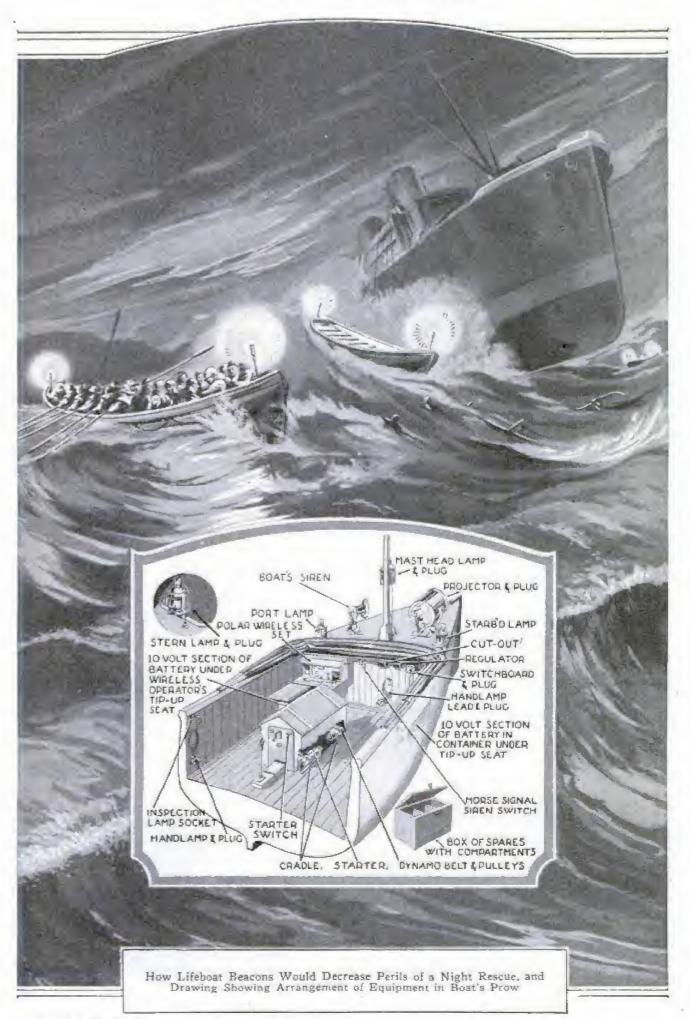
Instruments which make use of the principles of radio amplification of sounds for the help of the deaf have been available for some time and now the

vacuum tube has been adapted as a sort of "booster" for the telephone, so that persons hard of hearing may carry on conversation with but little difficulty. The apparatus is contained in a separate box which may be placed against the wall or in the desk. It can be adjusted to meet the needs of the person for whom it is intended, but its use by those not hard of hearing is discouraged as it naturally amplifies all sounds equally. Some hearing aids using radio are said to enable a person suffering from as much as a sixty-per-cent loss in hearing to understand normal speaking three feet away.

TUNNELS SPEED WEAR ON RAILS BY DAMPNESS AND SMOKE

Long tunnels are proving "rough on rails," since dampness and sulphur from the locomotive smoke speed corrosion. Wheels of passing trains chip flakes of rusted metal from the rails, leaving exposed portions open to further action from water and smoke.

POPULAR MECHANICS



LIFEBOAT RIGHTED BY RAILS ATTACHED TO KEEL

Two long folding rails attached to the keel of the lifeboat have been devised by



in case it capsizes. The rails are within easy reach and when not in use, lie flat against the keel so that they do not interfere with the position of the boat in the deck racks or davits.

STEEL AND REFINING COSTS CUT
BY SILICA PROCESS

Marked reduction in the costs of producing steel, refining petroleum and of refrigeration is forecast by Dr. W. A. Patrick of Johns Hopkins university. through the application of an absorbent substance known as silica gel which he invented during the war. It is made with water glass and acids and resembles coarse sand but contains innumerable pores so fine that they cannot be seen even under powerful microscopes. Prof. Patrick estimates that the total surface of the pores, in one gram of silica gel would cover half an acre. The material's use in the manufacture of steel lies in its ability to absorb the moisture from the air that enters the blast furnaces. vapor often causes considerable difficulty, but the silica substance, it is said, practically dehydrates the air. Its use is reported to have increased the output of steel in one factory ten per cent and to have decreased the cost of coke fifteen

per cent. In refining crude oil, the gel helps remove sulphur-bearing elements and gum-forming compounds, and the method is said to be cheaper than any yet found. In refrigeration processes, the gelacts as a vacuum pump in absorbing the water vapor and causing freezing as a re-sult. This method of turning water into ice, that is, by pumping off the vapor, has been used for many years. The silica gel makes the use of a pump unnecessary. It absorbs the vapor and condenses it into By placing a small flame under the gel, this condensed vapor is driven off, leaving the material free to absorb more vapor. The process is continued until the water is frozen, and thus ice is actually formed by the application of heat. Theoretically, eighty pounds of ice can be obtained from 100 pounds of water by evaporating twenty pounds of the latter.

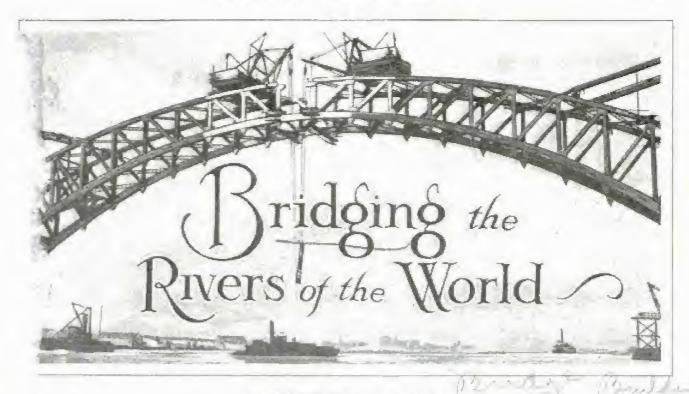
BY LEANING RIGHT OR LEFT

Suited to children from four to fourteen years old, a coaster now on the market has no tongue or handlebars but is steered simply by leaning to either side. This shifting of the weight causes all four wheels to turn in the desired direction. One knee rests on top of the coaster and propulsion is obtained by pushing with the other leg. Rubber tires and steel disk wheels add to the pleasure of riding.



Without Handlebars or Tongue, This Coaster Is Steered

2915 D. Wabail



By BOYDEN SPARKES

was in the Philippines, on the island

of Luzon. American engineers in olivedrab khaki and leathern boots that laced
to their knees were cutting a swath
though a jungle inhabited by half or
nolly savage people. Stung by insects
d harassed by homesickness, these men
ere building a railroad, using breechouted natives to perform the labor.

Now the construction had reached a ocky gorge down which tumbled the hite water of an unnamed river. There bridge was necessary. For the engineers and their white foremen that bridge was nearly a finished mental job. A sheaf of blue papers, marked with ruled lines of white and with mystical figures and urves and other symbols of engineers, was, for them, the bridge. Timbers and steel with which to build it had followed them on rails that had pushed the frontier of white man's rule to the brink of that hasm.

The white foreman, Patrick Boyle, who served as the blasting expert of the bridge-building force that now moved in ahead at the mere railroad workers, had gotten, somewhere, a brown flat-faced assistant, Jose de Pina y la Cruz.

The day the crew moved forward to blast away the surface clay, the foreman seemed in a bit of a hurry. A round, vertical hole had been drilled down into the clay. Dynamite sticks, with percussion caps affixed to flexible, insulated wires, were placed by him in this drill hole.

"Pronto, muchacho!" he ordered and then, with a mixture of Irish brogue and bad Spanish, instructed his assistant to carry the magneto box with its plunger over the hill, uncoiling the wires as he went. He finished with a warning to the Filipino to wait beside the magneto box until he, the boss, arrived.

Some of the men whose work waited on this blasting job retired over the hill with the native assistant of the blasting boss. They saw him select a spot sheltered as much as possible from any flying rocks. They saw him fasten the copper wire ends to the binding posts of the magneto box. Then, before any of them could frame suitable words of remonstrance, they saw the little brown man lift the plunger and drive it down.

There was a ground-shaking explosion. With a reverberating "boom," something like a volcano seemed to have been opened on the other side of the hill. Clods sailed high into the air and in the center of the inverted cone of debris, as if to answer an unspoken question in the minds of the watchers, was a bright red fragment of what had been a flannel shirt.

They reassembled Patrick Boyle in a basket, but Jose de Pina y la Cruz, who had started to run away when he recognized the import of that bit of flying red cloth, did not even return for the funeral services.

I thought of that incident the other day when Ralph Modjeski, one of the most famous bridge builders of the world, told me that as a rule the loss of life on bridge-building jobs is due to inexperienced workmen. "There are unavoidable hazards connected with the work," he said, "but as a rule it is the green man who takes hold of the wrong rope, or steps on the unsecured bit of staging, or does something else against which the experienced workman would have been warned by a knowledge as sure as instinct. Sometimes, though, accidents happen to the most cautious, the

most experiworkenced men. I have had a few narrow escapes myself." Then he told about a critical day in the construction of a bridge he built across the Mississippi at Thebes, Ill. It was the great moment in the building of a bridge, the making of the central connection, the placing of that final link which



Erecting the Giant Towers from Which the Cables of the Delaware Suspension Bridge Are Hung; the Towers Are 380 Feet High

makes the structure an actual bridge. There was a gap of about twenty-five feet separating the steel arms that had been built out over the river from opposite shores of the wide Mississippi. Two groups of workmen for months and months had been working toward each other. If the reckonings of the engineers or the performance of the contractors were inaccurate in the slightest degree, that perfect junction which was necessary would fail. No matter how confident an engineer may be, it is a problem for which mere paper answers are unsatisfactory. Relief does not come until that rendezvous of steel high above mid-river has been kept.

Mr. Modjeski, treading as sure-footedly as any of the contractor's cat-footed steel workers, made his way out to the end of one of the outthrust arms. One hundred feet below him the yellow waters of the greatest of rivers moved toward the distant Gulf. A flat car, bearing a pin that was about to be set in position by a giant traveling crane, was at the end of that part of the unfinished span where Mr. Modjeski stood. It was not an ordinary pin. It weighed something over a ton.

At a signal, the man in the control cabin of the traveler swung the long arm of the boom into position, but a trailing cable knocked against the pin. It started to roll. Mr. Modjeski was standing on a plank, holding by one hand to a cast-iron loop on the side of the flat car. He saw at a glance that the pin was not going to catch him in its fall, but he saw, too, that the dragging cable was going to sweep down on his outstretched arm. He re-

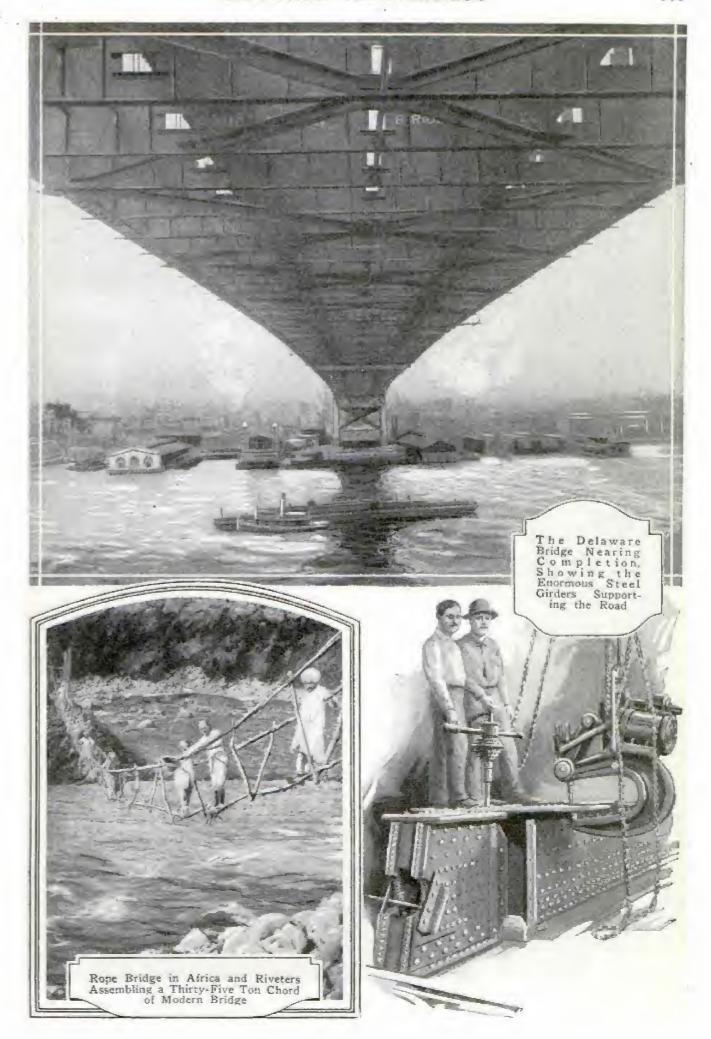
leased his hold on the car, and as he did so. the huge pin crashed down on and broke the plank on which he stood. In a flash he had grabbed the iron loop again a n d hung with nothing but air between him and the Mississippi far below. Some of the other workmen quickly leaped to the relief of the chief engi-

neer, hauling him safely to the floor of the car a few seconds after the geyser splashed up by the fall of that great pin had dropped back to the river.

The building of bridges is in the field of engineering what grand opera is to musicians, or Chinese porcelains to connoisseurs of art. It is a work that calls for skill and daring. But above all else, the successful completion of the work calls for a fanatical accuracy even to the least of the details. A single error of mathematics, or the tolerance of any of that sort of scamping that is more or less common in the erection of big buildings, and there is an accident like that which occurred in 1907 to the first bridge which the people of Canada tried to thrust across the St. Lawrence river at Quebec.

It was within fifteen minutes of quitting time for the eighty-five men who were working on the mighty web of steel which these human spiders were spinning across the St. Lawrence. Suddenly they felt the vast structure sinking beneath their feet, at first a slight sag, and then, with a grinding, crashing noise, a drop of thousands of tons of metal into the water. Seventy-four of the workmen died in that horrible fall; eleven others were picked up from the river and taken to hospitals.

POPULAR MECHANICS

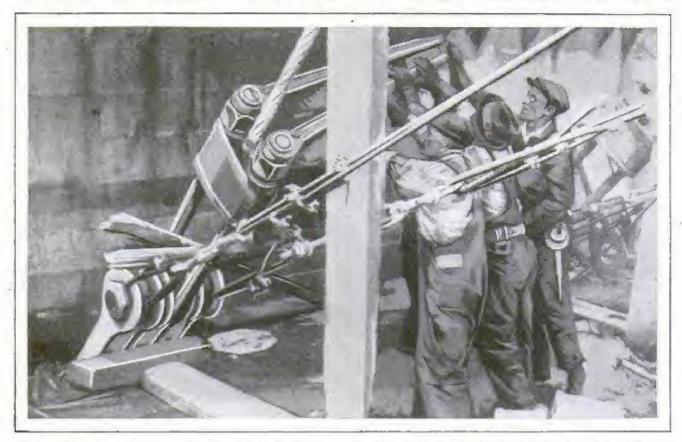


POPULAR MECHANICS

It required a lot of inquiry to fix the blame for that collapse. Engineers say it was the result of an inadequate inspection service, and, also, of anxiety to build a bridge too light in design. Somewhere in the planning there had been a human failure. It was not the steel that failed; the metal had simply been assigned a task too great for it.

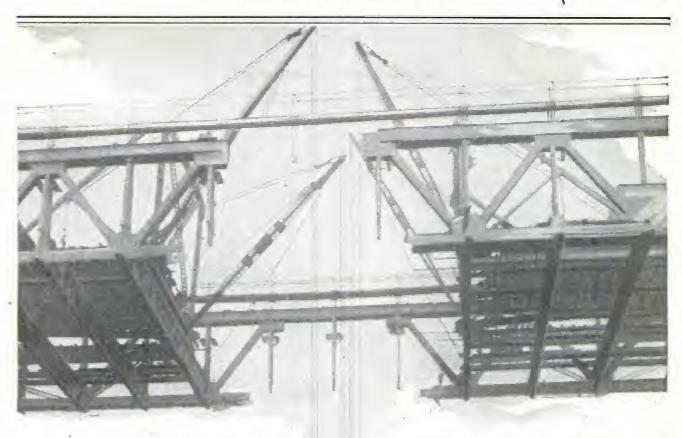
Even the least of bridge-building jobs is a tremendous struggle and the umpire is the law of gravity, with which there can be no argument. When the United States was spreading itself across this

out of insurance benefits are the caisson workers who report at the call of any contractor who undertakes a big bridge job. They are the men who work under heavy air pressure below the level of water, when the foundations are being laid on the bed of the stream that is being bridged. When Mr. Modjeski was building the Memphis bridge across the Mississippi in 1914, about the time Europe flamed with war, something happened which helps to justify the attitude of actuaries toward caisson workers. It was at the Arkansas end of the J. T. Harahan bridge. Eight



Four-Foot Wrenches Give the Leverage for Tightening the Clamps Which Hold the Steel Cables of the Delaware River Bridge; the Cables Are Spun in the Air from Individual Wire Strands

continent as ink from an upset bottle widens in a huge blot, there was always an ample supply of men to occupy whatever posts of danger there were to be filled. Grizzly bears, hostile Indians, rattlesnakes, bad men of every race were not sufficiently menacing to hold back that spreading flood. Human nature has not changed; the frontiers of today are the places in the community where those men work whose occupations are rated in the tables of insurance actuaries as "risks not acceptable." This phrase means that the hazard of their jobs is at least 200 per cent greater than the normal hazards which confront those who serve as lawyers, oculists, florists, auditors and in other mild occupations. At the forefront of those aristocrats of hazard who are counted men, one of six gangs of caisson workers, started down a ladder into a vertical shaft to the air lock above the working chamber where the gang they were to relieve was expecting them. About fifteen minutes later, an impatient signal inquired of those in charge at the surface why the relief had not been sent. Immediately the outside lock tender and the superintendent began to descend the ladder to investigate. Thirty feet from the bottom of the shaft the lock tender called out that he could see the men piled up at the bottom. He did not finish his observation. An unseen enemy had filled his lungs, poisoned his blood. Without a cry, his hands relaxed and he too plunged downward onto that cushion of dead men. The shaft was filled with a gas that had been generated



mysteriously. The men in the working chamber beneath that death trap were brought out one by one in a hoist bucket through a material lock. The dead were brought up by men in diving suits and helmets. It was one of those unavoidable accidents that beset the men who make our wonderful transportation systems possible.

transportation systems possible.
"They follow the job," Mr. Modjeski told me. "Fear seemingly has been left out of them. On the Philadelphia-Camden bridge over the Delaware river where I am now engaged, it was suggested that the iron workers wear life preservers so that any who happened to drop into the river might have a better chance of surviving, but they scoffed at the idea.

"We have kept speed boats in the river ready to dash to the rescue of any who dropped into the water. We have used circus life nets. We have kept these nets strung be-



Hoisting the Connecting Girder in Place to Link the Ends of the World's Longest Suspension Bridge

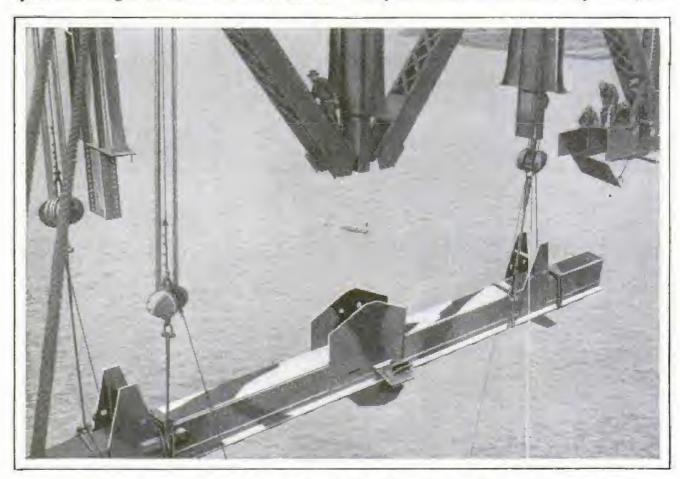
neath the ends of the bridge as the steel was pushed out from the shores of Pennsylvania and New Jersey. We took exceptional precautions with the staging, but in spite of all this the number of men who have lost their lives that this bridge might be built is just about the same in proportion to the weight and cost of the structure as on any of the large bridge-building operations."

Work had just started for the day one morning last August, when Theodore Jorines and Albert Miedema rode out into space on a huge steel beam that was about fished out so little disturbed by the accident that he only stopped to change into dry clothing before returning to work.

"Since it is to the first interest of contractors to reduce the loss of life on these undertakings, the problem is being studied constantly with the idea of making the

work less dangerous."

"If bridges are better today than forty or fifty years ago," Mr. Modjeski said, "it is because steel is better. The most important stride forward since I started was the invention of pneumatic tools. When every rivet had to be driven by hand, en-



Sure-Footed Iron Workers, Perched Far above the Swirling River, Wait to Bolt and Rivet the Last Connecting Girder in Place, Completing Their Work on the Delaware River Suspension Bridge

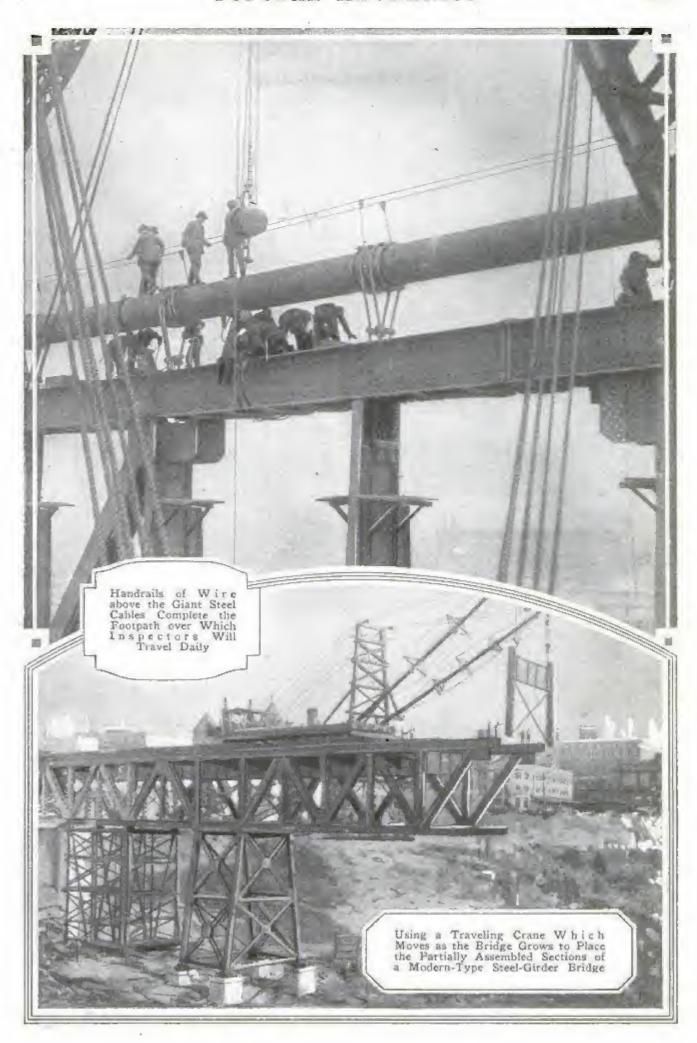
eling crane. The men were standing up, arms outspread, to signal, when the beam slipped in the slings. They were thrown, of course, and turned several times in the air before they struck the river bank sixty feet below. They were the sixth and seventh men to die, and since that time, four or five of their fellows have fallen to death or otherwise been fatally injured.

"They get reckless," explained Mr. Modjeski. "But even so, I have seen them fall and live. On the bridge at Thebes one iron worker missed his footing and fell 110 feet into the Mississippi. That is a long way to drop. However, he was

gineers saved as much as they could on rivets. Now we can afford to be prodigal with rivets, which is important because of the steady growth of the loads that

bridges must carry today."

There are still some thrilling challenges that have not been met by the bridge builders of the world, according to Mr. Modjeski. One of these is the straits of Dover; another is San Francisco bay, where a 3,000 or 4,000-foot tunnel combined with a bridge would be necessary; another is the Hudson river as it flows past Manhattan island, where a span of 3,400 feet would be necessary in order to satisfy the exacting requirements of the war department.



378 for Parker Popular MECHANICS



Ornamental Concrete Work of Unusual Design, a Staircase Cast as Unit in Molds

SPIRAL STAIRCASE OF CONCRETE CAST IN SINGLE MOLD

Planned and built by a practical construction man, a spiral staircase in a Florida printing plant, has no central support, but is said to be capable of standing

a strain of 170 tons and has a carrying capacity of 4,800 pounds. It was built in a single unit from a mold carefully measured to specifications and the concrete poured around reinforcing. Its surface was grained to resemble that of marble. Besides giving an artistic touch to the interior, the stairway saves space.

WEEDING RAILWAY RIGHT OF WAY WITH STEAM

When growth of weeds became troublesome along the right of way of a southern railroad, one of the engineers devised a way tookill shem with steam. A "sprinkler" arrangement was attached to the front of the locomotive with shields to direct the vapor down against the track. Moving slowly, the engine thoroughly treated the weedy section, the steam proving especially effective close to the ties and between the rails where the growths would have been hard to reach by other means. Another use for the steam system is in clearing snow and ice from switches.

742 Joy —— TESTS WITH MODEL RUNWAY SHOW CAB DRIVERS' SKILL

Are you mentally qualified to drive a cab? On the basis of actual results from more than eighteen months of experiments, Dr. A. J. Snow, consulting psychologist for a large Chicago cab company, feels that science has a means of determining the answer with a considerable degree of accuracy by a series of interesting psychological tests, some of which were described in Popular Mechanics in November, 1924. At that time, the examinations had been given too short a time to derive definite conclusions. But since then, after testing more than 12.000 drivers and prospective drivers, analysis of the findings has been made.

Briefly, the tests aim to determine the subject's intelligence; his ability to react to lights, sounds and the sense of touch; and whether or not he is likely to be reckless, easily scared or quickly fatigued. The trials are now given by cab companies in more than a score of cities. Some con-



vania makes use of a toy electric railroad to determine if a prospective cab driver is mentally fit to receive a license. The subject is asked to control the tiny cars with hand and foot levers according to the directions of lights flashed on a board in front of him. False signals are also given to determine if the candidate is easily distracted. The examiner has a set of controls to govern the lights and move the cars. Dr. Snow's analysis of results shows

that the eight tests he has used provide a means for weeding out the unfit candidate for cab driving. Out of the 12,000 men tested, some fifteen per cent were rejected because of unsatisfactory showing in the mental examinations and tests. But the concluons were not drawn m the mere paper recds made by the candiites. For ten weeks. hen the examinations vere first started, careful files were kept of the performance both of men who passed the tests and of those who did not,

for at the beginning even men who failed to pass were retained in order that they might be compared to those who received passing marks. In the ten weeks' trial period, twenty-one men who had made unsatisfactory grades in the tests had twenty-six accidents, while 198 who passed creditably had but fifty accidents.

From January 1 to April 30, 1925, after the tests had been used as a basis of hiring drivers, while the company's business showed an increase of thirty-eight per cent over the same time for the previous year, accidents decreased three per cent, although, in 1924, they were twenty-nine per cent more numerous than during a corresponding period in 1923. From March 1 to May 1, 1925, the drivers were divided into two classifications, In one group were newly recruited chauffeurs who had passed the tests satisfactorily. They comprised nine and one-half per cent of all the company's drivers. In the second group were placed the rest of the men, scores of whom had had considerable experience and were known to be competent drivers although they had not been given the tests. In the period observed, the men of the first group had but .5 of an accident per man while those of the second had .8 of an accident each.

RIDING WINDMILL WINGS
THRILLS DAREDEVILS 95

Lashed to the wings of a Dutch windmill, more than 200 feet high, near San Francisco, Calif., daring human flies" enjoyed the thrills of an unusual ride

Viewing the World at the Expense of the Wind; Riders Lashed to the Ends of the Mill's Arms

around the huge circle described by the mill's arms. The open latticework on the blades afforded greater security than would have been possible on smooth wings, but the stunt demanded careful balancing. Photographers equipped with motion-picture cameras rode the mill and took views on their topsy-turvy journey.

HAS HINGED TOP

Radiator cap and thermometer are combined in a compact unit so adjusted that a quarter turn of a handle loosens the cap



so that it can be thrown back for water. Another quarter turn in the opposite direction secures it again. Since the cap is not removed entirely, there is no danger of its dropping or being lost, the handle keeps the

fingers away from steam and hot water, and the thermometer is locked to the cap in such a way that it cannot be taken off without special tools.

Sales Con Indicator

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"SPIDER NET" OF WOVEN CORD
SAVES LIVES AT FIRES

Patterned after a spider's web, a circular net of stout rope, is one of the Pole. It is believed to lie in the center of a huge ice field and to be more difficult to reach than the North Pole. A primary objective of the undertaking is to open up a trans-Arctic air route for com-

mercial purposes between the continents. According to Vilhjalmur Stefansson, the explorer, who is one of a board of seven chosen to make arrangements for the journey and who is said to have been the first to point to the existence of the Inaccessible Pole. four planes will be used to carry supplies of gasoline to Point Barrow, and the flight will begin at Nenana, near Fairbanks, the railroad ter-If land is disminus. covered before reaching the Inaccessible Pole, the plane will circle and return to Point Barrow after taking pictures. -The expedition will be instructed to take possession of any land found in the name of the United States. It is expected that no lower temperatures than those already encountered by various army flyers in altitude tests will be met, while improvements in the planes as well as the trained personnel of the

party will greatly aid its success. Capt. Wilkins accompanied Stefansson on his last Arctic trip. Others who have been selected for the expedition are Lieut. Benjamin Nelson, an experienced aviator, and Earl Rossman, an Arctic motion-picture photographer. Lieut. James H. Doolittle, winner of the Schneider cup, and Lieut. John A. Macready, army transcontinental flyer, have been asked to join the party.



Firemen in Drill with Life Net, a Circular Mesh of Stout Cord with Large Cable on Edge for Tight Grip

pieces of equipment with which Philadelphia firemen drill at their fire school to become efficient in saving lives. The shape of the mesh enables several men to keep a firm grasp on it, and the strands are so arranged that they will yield sufficiently to prevent injury to a falling body.

SEARCH FOR INACCESSIBLE POLE TO BE MADE BY AIRPLANE

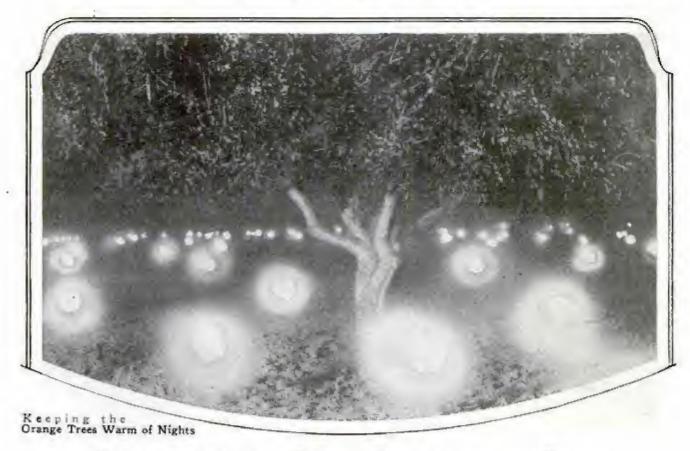
Where do the birds go when they keep on flying north? What sort of country lies some 400 miles from the North Pole at 84 degrees north latitude and 160 degrees west longitude? To answer these and other perplexing riddles of the land of ice, an airplane expedition, headed by Capt. George H. Wilkins, is planning to make a 1,900-mile non-stop flight from Point Barrow, Alaska, to Spitzbergen next May, in search of the sq-called Inaccessible

A CORRECTION

In the January issue, page forty-three, the statement was made that a moving model of a brontosaurus, as illustrated, had been made for the American Museum of Natural History in New York City. The model was not made for the museum, but is a reproduction of a fossil specimen on display there. It was made by Messmode and Damon, of New York.

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nort aveation Society



Upper Air to Save the Orange Crop

Unique "Windjammers" Bring Down Warm Currents to Mix with the Cold Air Which Collects on Ground beneath Groves

By N. C. McLOUD, 1717

ALIFORNIA fruit growers have learned that it is possible to reach up above the trees and protect their fruit from frost by bringing down the warmer air from above the orchards. To do this they have been working with ingenious machines known as "windjammers," intended to mix the warm air above with the cold layer near the ground. The process has brought interesting results.

This method of orchard protection had its origin in work of the United States weather bureau in demonstrating that

there is strong temperature inversion on the average frosty night in southern California, and that the air at the ground is several degrees colder than that above the tree tops. The findings caused inventors to attack the problem of keeping the air well

mixed and preventing its formation in strata.

More than one device along this line failed to meet the tests of actual use. The latest type is said to furnish adequate protection for ten acres. In this outfit there is a pipe of large diameter stretching up into the air for a distance of thirty-five feet. The apparatus uses artificial heat in addition to its function of mixing the layers of air. The pipe starts vertically at a point twenty-five feet from the ground. and is built in the form of an elbow, caus-

ing the upper end to be horizontal. The base is supported by an open framework. Below the lower end of the pipe there is a large oil-burning furnace. An airplane propeller, between furnace and pipe, forces heated air upward and causes it to be dis-



Three Types of Heaters Used in the California Orange Groves to Drive Frost Away

charged toward the tree tops. The warm current thus is sent forth to mix with the air lying above the orchard, to spread a

protective wave over the trees.

Another machine is of rather unusual design, which gives it similarity to a Chinese temple. This outfit is built entirely of steel, on a concrete foundation, and equipped with a gasoline motor of 120 horsepower, geared to a vertical shaft. At the summit of the structure, forty feet above ground, is an airplane propeller, connected with the shaft, and revolving at 700 turns to the minute. Operation of the propeller is intended to bring down warm air from above the trees, sending it through the tanklike "barrel" beneath the roof. In this barrel an oil-burning furnace gives added heat to the descending current, and the blast is then directed among the trees. At a point fifty feet from the outlet, the temperature is raised five degrees Fahrenheit without the furnace and eight degrees when the furnace is in operation.

Another form of machine, of simple construction, uses a fifteen-inch galvanized sheet-iron pipe, extending upward for thirty-five feet. Near the base is a fortythe other forcing it horizontally over the tops of the trees. Small oil burners supply additional heat for the currents. Without the furnaces in operation, the discharged air averages six to seven degrees higher than the outer air at the same elevation. The furnaces increase this difference to thirty-five degrees.

Orchard heating has passed through In the first attempts, long evolution. coal baskets made of large-mesh wire screen were set in the orchards at the rate of forty baskets to the acre. This gave good results, and brought the development of heaters burning oil. The first heaters had low stacks, and these were followed by high-stack outfits which gave better combustion and less smoke. The use of heaters on a large scale, however, creates a serious smoke nuisance, and properly developed windjammers are looked upon as the solution of this problem as well as that of actual protection.

Oil heaters are used also in the cranberry bogs on the Columbia river, where it is not possible to provide frost protection by flooding the bogs as practiced in Wisconsin and New Jersey. With the use of these outfits there is nearly seven





Left, Type of "Windjammer," Which Brings Down Warm Air from Above and Spreads It over the Ground; Right, Another Type That Sends Warm Air above Tree Tops; Both Use Airplane Propellers

inch centrifugal blower operated by a gasoline motor, to create suction for drawing the warm air from above the tree tops. The descending air is divided between two outlets, one throwing a current downward against the ground, and

degrees increase in the temperature at the surface of the vines.

One of the reasons the flesh of the salmon is red is that it contains a pigment of that color found in sea plants.



Drawing of Midget Plane in Flight, Showing How Pilot Lies in Fuselage and Operates Controls; the Entire Ship with Motor Weighs Only 125 Pounds

PILOT OF PYGMY AIRPLANE RIDES LYING DOWN 9

To save space, most of the fuselage of a tiny airplane introduced in Germany is devoted to a compartment for the pilot, who lies prone while managing the controls. The motor of the plane develops only four-tenths of one horsepower, and the entire ship, including equipment, weighs but 125 pounds.

HEALTH CHART HOLPS DOCTORS CHECK SPREAD OF DISEASE

By means of a carefully tabulated chart showing the number of cases in certain disease epidemics and the rapidity of their

increase or decrease, doctors of the Chicago health department are able to forecast, with a fair degree of accuracy, how fast an epidemic will spread and to make preparations for combating it. The chart is compiled from statistics gathered from the reports of a number of years and is arranged in graphic form according to the various health divisions of the city. When increase of sickness

above normal is discovered, if the ailment is of a contagious nature, extra precau tions can be taken at once, more physicians assigned to the afflicted district and other steps taken to stop the epidemic. .

STRAW PRESSED IN BRIQUETTES AS SUBSTITUTE FOR COAL

Burning the straw piles on the grain fields just to get rid of the waste will soon be a thing of the past, a Kansas professor predicts, for the material may be pressed into briquettes and used to partly sup-plant coal. It is first formed into heavy bales by a modified baler and then broken into smaller



sioner Bundesen of Chicago at the Disease Campaign Map

SCHOOL IN BATTLESHIP ON LAND TRAINS NAVY ELECTRICIANS

Because electrical installations in war vessels are so different from others, the navy has found it practical to erect a model wooden battleship on land at Hampton Roads Va., as a training school for electricians. It is constructed to scale and is equipped with practically all the electrical apparatus found on a real ship, so that students may learn how to lay circuits for light-

has been devised to meet the needs of the farm or country home. It utilizes power from small streams, is designed to give continuous service and requires practically no attention save to refill the grease

cups. No batteries, fuel or other expensive items are needed. Power is developed in either thirty-two-volt, 125-volt or 250-volt direct current, depending upon the size desired, one, three or five-kilowatt



ing and ventilating systems, for the turrettraining and gun-elevating gear, gun-fire controls and even the searchlights.

ELECTRIC PLANT FOR FARMS USES SMALL STREAMS

Completely incased so that a separate power house is not needed, a compact hydroelectric outfit now on the market

Small Hydroelectric Plant for Farm or Country Home Installed at Stream

capacity. The smallest will light approximately twenty-five forty-watt bulbs or run-a one-horsepower electric motor. The next provides sufficient current for seventy-five forty-watt bulbs or a threehorsepower motor, and the largest will light 125 forty-watt bulbs or run a fivehorsepower motor. Lamps such as are used in city homes and electric stoves, heaters, irons, toasters, and similar equipment, may be enjoyed on the farm with this power plant, which will also operate small machinery. The generator; instrument board, containing a volt meter, switch and cut-out; turbine rotor and shaft connecting it to the generator, are all protected from the weather in a platesteel housing. The unit is easily installed and the smallest will operate on as little as a seven-foot head and a flow of 250 cubic feet of water per minute

TRAIN SPEED TO RIVAL PLANE'S WITH ROLLER BEARINGS

If the public wants speed, the railroads can give it by constructing steel-trussed concrete roadbeds and using roller bearings, according to Frank H. Alfred, president of the Pere Marquette railway. Schedules comparable to those maintained by airplanes can be followed, he predicts, while the superior safety of the railroads will be continued. With the aid of engineers, he has worked out the type of roadbed and bearings, and by their general

POPULAR MECHANICS al

adoption, expects the lines to remain the standard of long-distance transportation. A recent report to the American Railway association showed that several railroad-operating records were established in 1925. The greatest volume of freight traffic was handled; more surplus cars and locomotives were kept in serviceable condition, eliminating delays; the greatest single-month volume of traffic was reached in October with a total of 44,061,-988,000 ton-miles; for the week ending August 29, car-loading records were broken with a total of 1,124,436; the average daily movement of all freight cars reached a peak in October with 32.2 miles; less than carload-lot and miscellaneous shipments exceeded, by more than 2,000,000 cars, the record for the previous year; on September 30, 1,090,693 freight cars were moved, the greatest number in history, and the average load of freight per train was 796 tons in August, another high mark.

AUTO THAT BUCKS LIKE HORSE LATEST MOTOR THRILLER

Co Bean Hall

Plunges and turns like those performed by a bucking broncho are duplicated by a specially devised automobile for amusement-park patrons. The front part rises like a rearing horse, while the rear wheels carry the vehicle forward and around in circles. Several persons can ride in it at the same time, and spectators are given thrills as well as the occupants. FRAME FOR PRESIDENT'S PHOTO MADE OF BEADS AND SILK A

Das fritases

Containing 2,000 yards of silk thread and



War Veteran and His Gift to President Coolidge, Elaborate Frame of Beads and Silk

a decorative frame for President Coolidge's photograph has been constructed by a World War veteran and presented to the chief executive. Several hours a day for six months were devoted to weaving the design which includes a replica of the flag, lettering and border figures resembling those of Indian origin.

CORN WITH FOURTEEN EARS IS
DEVELOPED BY BURBANK/ 00 2
During 1925, Luther Burbank produced

a variety of maize from his rainbow corn, which grows to a height of eight feet and has from eight to fourteen ears to a stalk. This is but one of the plant wiz-

but one of the plant wizard's developments for the year. He announced that he had perfected several major creations and improvements. A new camassia, a striking

blue flower; a new species of torch lily that will bloom profusely in cold climates; an improved strain of the popular Shasta daisy; new fluffy giant asters and the development of eighty newly named gladioli are included in the year's accomplishments. He considers 1925 one of his most successful years.



Geared to Buck and Plunge like a Broncho, This Roomy Motor Car Affords Pleasure-Park Patrons Nevel Thrills

al annual convention of of

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386 dudianapolis chia FOPULAR MECHANICS

PORTABLE TANK FOR SOLDERING SAVES LINEMEN LABOR

Intended especially for linemen in making repairs, a portable acetylene torch,

der the hull, ten feet back from the bow, the mud defying all efforts to remove it by various means. Finally two fire tugs were requisitioned, their nozzles removed and attached to long six-inch bronze

Repairing a Break in Line with Portable Welding Outfit; Acetylene Tank Slung on Pole and Special Torch

which can be slung over a crossarm or the top of the pole, quickly heats the soldering iron where the break is to be mended, saving preheating; extra trips and wasted time. An additional advantage is that the flame is not likely to be blown out even on extremely windy days. The torch shaped to fit the particular needs of the line repairman and is light and easily handled. The special iron that goes with the outfit is attached directly to the gas tank, which is fitted with straps that may be adjusted over the lineman's back.

FIRE-BOAT NOZZLES ARE USED TO SALVAGE SUNKEN SHIP

How the monitor nozzles of two fire tugs enabled the British admiralty to raise a sunken ship, after six weeks' effort by other means had failed, has been revealed by Sir Frederic W. Young, famous English salvage officer. The ship had been sunk by a German torpedo in a soft mud bottom. To lift her with her valuable cargo, it was necessary to place thirty-two nine-inch steel cables under the hull, attaching them to winches on pontoons floating on the surface. After six weeks' work, only one wire had been placed un-

tubes, connected to the fire-boat boilers and lowered to the bottom. The divers guided the nozzles as the high-pressure steam was turned on and literally blew tunnels under the wreck. The entire thirty-two wires were placed in three weeks, and the vessel, weighing 5,200 tons, was successfully lifted by pontoon barges. Frederic also has revealed that the equipment with which the admiralty broke all previous lifting records at sea, consisted of six old 165-foot barges, hastily converted with any sort of parts and equipment which could be picked up without interfering with urgent war work in the shipyards, a circumstance to which he attributes

their success. "If time had permitted," he said, "the vessels would no doubt have been elaborately altered to preconceived conditions, and much of their efficiency would have been destroyed."

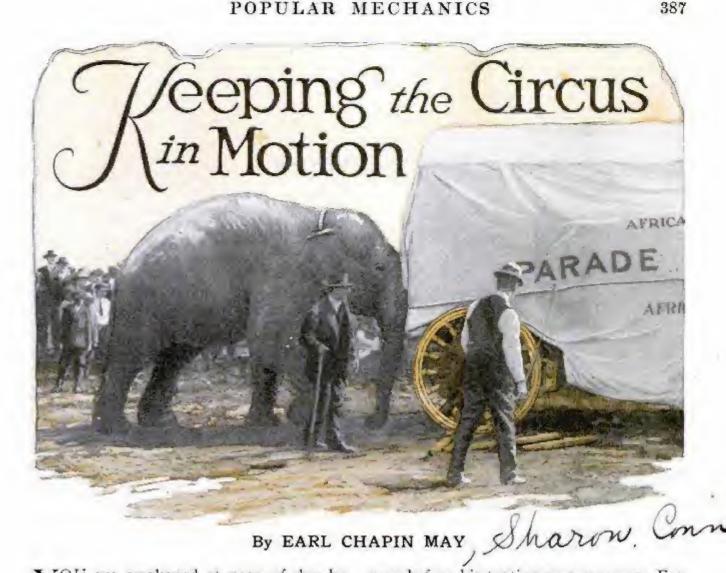
VALVE PACKING IN AUTO MOTOR REDUCES POWER LOSS

Attached to the valve stems of the automobile engine, a special packing has been

devised to seal the intake chamber, thus preventing air leaks and dilution of the mixture from the carburetor. It is intended to afford maximum power from each cylinder, decreasing cold weather troubles, and is said to last for 10,000 miles. The packing is held in

cold weather
troubles, and is
said to last for
10,000 miles. The
packing is held in
place by a spring adjusted between the underside of the valve head and a cup which

Lindblom Cut Part Co.



OU are awakened at peep of day by that unmistakable rumble of steelhubbed circus wagons. You tumble out of bed and into your clothes. If you are lucky, you reach the railway yards in time to see the last of the hooded cages roll down the inclined "runs" from the gaud-

ily painted circus "flats."

You trail this last cage, drawn by a team of dappled grays, to the circus grounds. There you may help erect the white tents, place the circus seats, water the elephants and in other ways prepare for the show which has been heralded by the billboards. You emerge about ten o'clock at night from the brilliantly lighted big top and stumble through deep darkness to home and bed, dog-tired. And on the following morning there is nothing left of one glorious day but fragrant memories and a few bits of rubbish where once the magic city stood. Circus day has come and gone!

"I wonder where they went from here," you remark. This is merely the echo of a question levied all the preceding day by hundreds of other "towners." No matter where a circus man goes he meets that constant query, "Where do you go from here?" It is an old question to the circus

man before his tenting season opens. For winter and summer he is asking himself, "Where do we go from here?" This question is prompted by the circus man's necessity for moving his amusement factory into a new cash market 150 times or

more each season.

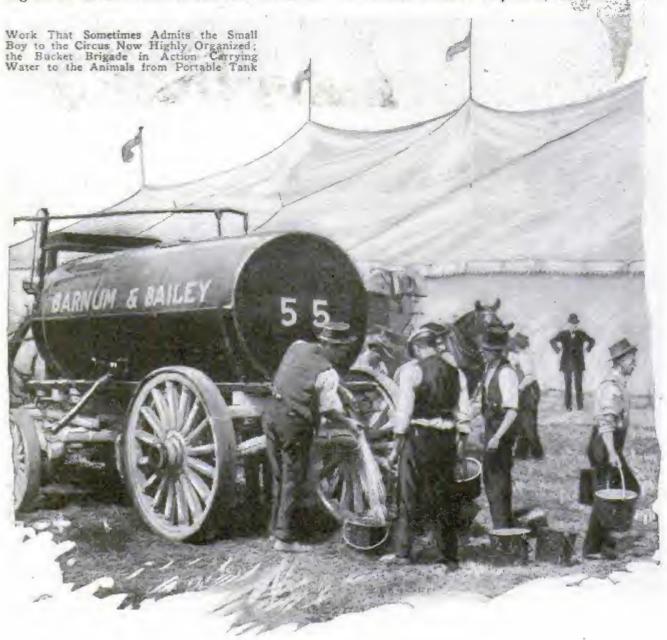
Motion is the essential characteristic of a circus. With the exception of a few big cities, such as New York, Chicago, San Francisco and Los Angeles, the "one-day stand" is the rule of the road with the fifteen bona-fide circuses attended by 12,000,000 Americans each year. To the towner who watches, with amazement, the smooth functioning of a traveling circus, the daily routine of setting up and tearing down is a thing to wonder at. But the circus man knows that his biggest problem is the problem of finding a market—of "routing the show into the money." "Any boob can run a circus; the trick is to know where to put it," old circus men say.

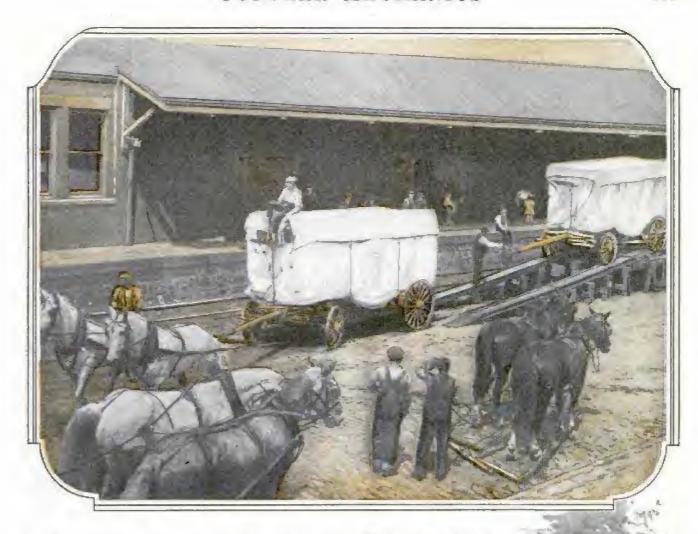
The circus that visits your town this season may have a cash replacement value of anywhere from \$200,000 to \$2,000,000. A twenty-car, three-ringed affair, is worth \$300,000 "on the rails." It costs \$3,800 a day to keep it in motion. The annual cost of repairs, replacements and winter upkeep is about half of the cash replacement value. So, such a circus must not only maintain an average daily income of \$3,800 per day from April 1 to December 1—the length of its tenting season—it must also show a profit of at least \$150,000 during the season in order to break even. To accomplish this feat in tented-world finance, it must and does travel about 12,000 miles each season.

This yearly accomplishment is comparable to that which the owners of a candy factory employing 400 people would perform if they erected their factory in a new town each morning, made and sold, for cash and locally, from \$3,800 to \$7,000 worth of candy before ten o'clock that night, then tore the factory down, loaded it on railroad cars, moved it from twenty-five to 250 miles that night and repeated that process for five months without pausing more than twelve hours in a town or

"stand," Sundays excepted. When a circus comes into winter quarters about December 1, the owner knows pretty well where it will go during the next year. And he builds his next circus in accordance with that information. The size and character of any circus are determined by the territory through which it is to travel. And the territory is determined largely by trade conditions. The circus man gets this vital information from banks, railroads, commercial agencies and crop reports, but in the last analysis he depends upon the "dope" sent him by local billposters or other tipsters.

The memory of a successful circus man on trade conditions is prodigious. He knows the population and character of every town of more than 2,000 in the United States and Canada. Moreover, he knows the population of each county in which those towns are located, the amount of circus license required, the character





and cost of the circus grounds, their distance from the unloading or "spotting" point in the railroad yards, what time in the year is the best to visit that particular town and, what is vastly more important, what kind of a "show town" it is.

tant, what kind of a "show town" it is.

Plainview, Tex., for example, has a
population of about 4,000. It is away out
in the Panhandle country. Yet the SellsFloto circus traveled 281 miles to get to
that town last fall, because its owners

knew that there would be 10,000 persons in town, if weather and crop conditions were fair, to see their circus. But a New England town of 4,000 can rarely be counted on for more than 2,000 circus patrons. The Sparks circus played Yazoo City, Cleveland,

Okolona and other Mississippi towns of from 2,000 to 3,000 population last October, but "cleaned up" in each town, because there was a bumper cotton crop. I have known the Ringling Brothers and Barnum & Bailey combined shows to play to 25,000 people in such towns as Fairmont, Minn., Concordia, Kans., and Norfolk, Nebr., because they knew that

Hauling the Animal Cages from the Flat Cars; Below, Crew of Dapple Grays, Willing and Alert Circus Movers

crops were good, the towns show-hungry and that, if they came into these towns just after the wheat harvest, there would be four times as many circus fans in the big top as there were citizens in each town.

There is a tradition in the circus business that either John or Charles Ringling can, while traveling through the country at night, stick a hand out of a Pullman





Assembling the Cages at the Show Grounds, and Work Horses Leaving the Railroad Freight Yards; Train of Cages at Left

window and tell what town they are approaching "just by the feel of the air." They know every blessed angle and corner of this fair land, do these circus people. But what is more, they know the history of each of the myriad towns which they may want to visit or avoid. This marvelous acquaintance with trade history and possibilities was illustrated to me one day last spring by Charlie Sparks.

We were standing at his canvas front door on the circus lot at Jackson Heights, Long Island. It was in early May, My own town. Rochelle, Ill., was circus-hungry. It had not been visited by a circus for many years. It was and is a very prosperous town of 4,000 population, with a number of good factories and in a rich corn and oats section. The chamber of commerce had asked me if I could not get a good circus to visit Rochelle. So I put it up to my friend Charlie.

"Why don't you make Rochelle in July?" I asked him. I mentioned July because Illinois and other corn-belt towns are, at their circus-best just after the corn has been "laid by" and the farmers have time to come to town. Without hesitations a mamont South

ing a moment, Sparks replied, "No chance. The Gollmar show played Rochelle to only \$2,800 eight years ago. My nut is \$3,800."

I asked him about twenty other towns in various parts of the country. He reeled off facts and figures about them with equal ease and rapidity. If the average sales manager for any big manufacturing concern knew as much about territory as does the average circus owner—who is both production and sales manager—there would be fewer failures in American business.



But the circus man has to know a lot more than merely trade facts, figures and history. He has to know whether the railroads will carry his circus into desirable territory at the proper times. The Florida east coast is a rich territory late in the fall. But nearly every fall the East Coast railway places an embargo on circuses. It has too much passenger and fruit business to handle.

Having decided in January upon the coming season's territory, a tentative route is laid out. After that, the program covering transportation is about as follows: Railroad contracts for the various movements from town to town are signed about three months in advance of the desired movements. About three weeks before the circus is to exhibit in Ionesville, Va., the

exhibit in Jonesville, Va., the "bill car," loaded with thirty billposters, banner tackers, programmers, lithographers and press agents, arrives in Jonesville and bedecks town and countryside for twenty miles around. The bill car is followed by a "box brigade" of five or six men, who travel by rail or motor car, usually by rail, to patch up after the bill car, especially if any opposition circus has been "covering paper." Anywhere



Above, Springtime Rehearsal of an Act to Entertain the Thousands Who Will Crowd the Big Top Later in Summer

from ten days to two months ahead of this box brigade, the contracting agent has arranged for circus license, circus grounds, meat, bread, hay and a dozen other essentials. One day ahead of the circus the "twenty-four-hour man" checks up on all these contracts, to be sure there will be no hitch in the proceedings.

If all's well with the world and the show has not been stuck in the mud of a previous day, or has not been wrecked on the road between towns, it rolls into Jones-ville about four in the morning. Ten minutes later, it is "spotted" at a convenient crossing arranged for by the twenty-four-hour man. That worthy leads the "stake-and-chain" gang to the circus grounds. This gang lays out the plot by some mysterious method of surveying, marking each stake and center-pole location with an iron pin to which is attached a bit of red flannel, known as "the flag."

Twenty minutes after the stake-andchain gang has left the circus train, the railroad runs are down, and the first wagon—the cookhouse or commissary wagon —is rolling toward the circus grounds. In an hour, all the wagons are off the flats, all the human beings and live stock unloaded and the big tops and smaller tops are rising. By ten o'clock the parade is on its way downtown. By one-thirty the last of the blue seats are in place. two-fifteen the afternoon performance is on. By four-thirty the afternoon concert or "after show" is over. By five-thirty dinner is concluded, and the last husky hustles out just as the "flag comes down," indicating that meals are over for that By six-thirty the cookhouse and stables are on the way to the railroad yards. By nine p.m. the menagerie and sideshow tents are "torn down" and loaded. By ten-fifteen the night show is over. By midnight every bit of the circus property has left the circus lot. By one a.m. the circus train is loaded and on its way.

And so it goes day by day. It is motion, motion, motion-provided the elements do not interfere. Weather is the one thing no circus man can figure on with certainty. He can, if he must, switch his circus route, on one week's notice, although such a switch is vastly expensive. But he cannot guess effectively on the weather. That is his one big bet. Last season the Sparks circus played to weeks of unbroken heat in Oklahoma and Kansas, heat so prolonged and intense that it was finally found necessary to do an almost unprecedented thing - wet down the canvas to keep it from dryrotting. Then the show ran into weeks of cloudbursts, so tremendous that many a night show was lost in the southern Mississippi valley. For twelve days all hands stayed on the lot and helped pry the show out of

The thing that keeps a showman in the show business is the thing that put the covered wagon across the western prairies. It is the fascination in wondering what lies beyond the horizon—the constant search for the pot of gold at the rainbow's end,



Motor-Driven Hammers Pound the Pegs for Some Shows, but the Skilled Sledge Gang Is Still to Be Seen, an Important Unit When the Circus Moves

DPULAR MECHANIC THRILLS OF INDIAN WAR DAVS RECALLED BY MILES' RELIGE

Rifles used by Indian chiefs, war bonnets, and clubs as well as peace pipes are included in a valuable collection of relics gathered by the late Lieut, Gen. Nelson A. Miles, which have now been housed in the Museum of the American Indian, Heye Foundation, in New York. The articles recall many stirring and important events in American history and are considered especially valuable to writers, research workers and scholars as sources of reference. Among the five rifles is the one carried by Joseph, chief of the Nez Perce tribe, who surrendered to Miles in 1877 after a masterly retreat. When the chief handed the weapon to his victor, he said, "From where the sun now stands, I fight no more against the white man." Another rifle was taken from Geronimo, an Apache leader who waged war for several years against settlers in Arizona and northern Mexico. The rifles carried by Chief Rain in the Face, Chief Lame Deer, a Sioux who attempted to kill Gen. Miles but missed and slew a soldier standing near by, and one that belonged to Sitting Bull, who was routed by Gen. Miles in the battle of the Little Big Horn, complete the collection. Other relics include an Arapahoe shield painted with characteristic figures, a drum, bows and arrows and a flute employed by the youth of the Sioux Strengthing Vegetables in Adjustable Press Which Binds tribe in their wooing. tribe in their wooing.

COIN-IN-SLOT MACHINE HOLDS THIRTY DIFFERENT THINGS

which is easily operated and automatically rejects imitation coins. slugs or other foreign pieces. It has large glass-covered face, resembling that of a clock. By moving an arrow indicator opposite the space which holds the object the pur-

contents of the vender is attached to the The machine is loaded from the rear, articles being placed in small packages for easy dispensing.

FOOT-POWER VEGETABLE TIER SAVES TIME AND LABOR

Bunches of vegetables or flowers are quickly and securely tied in a simple out-



cutting string or tying knots by hand. The operation of the lever makes the cord against a support on a tablelike rack at the Thirty different articles are dispensed top of the apparatus. The levers move in from a slot machine now on the market bronze bearings, adding to the ease of which is easily op-

MEALS SERVED IN MOTOR BUS ON LONG-DISTANCE RUN

Passengers of a motor-bus line from Los Angeles to San Francisco are served with luncheon from a compact kitchen Debuilt as part of the vehicle. A button on the side of each chair summons the steve and who takes orders for either hot or cold dishes. The bus also has a special compartment for women, another for smokwing and a third for the driver. The entire chaser desires, dropping the coin in a slot rear panel of the smokers' room is a plate and pressing a lever, the merchandise falls glass window which permits an unobinto a cup at the bottom. A list of the structed view of the scenery. Washroom space is also provided.

> (Six months is said to be the average life of a dellar bill

Duringe

SHOP WINDOWS SET AT ANGLES AFFORD BETTER DISPLAY

So that prospective buyers may view the goods from the side as well as from the front and to increase display space, Letters or other documents are copied from the original just as they would be duplicated on a typewriter, and when the distributor is operated after the impressions have been made, defective or worn type is separated and discarded automati-

cally, so that at no time in the process of preparing the forms or resorting is it necessary to handle the individual characters.



@ Henry Miller How a German Shop Keeper Has Obtained Extra Show Space; Windows Are Set at Angles, Giving Better View of Goods

a German merchant has constructed his show windows in triangular units. The plan gives a store in the middle of a block something of the advantage of a corner location-show room on two sides.

TYPE-SETTING MACHINE SAVES TIME IN COPYING LETTERS

For duplicating letters, an office outfit

and keyboard, is said to reduce the time required for preparing the copy from about two hours to five minoutes. To accompany this machine, a distributor has been devised which sorts the type back into the proper compartments of the holder. The setter is about four feet high, two and one-half feet wide and sixteen inches Set-ups are deep. made directly into the drum of a standard duplicating device or into flat chases suitable for use on presses.



As Keyboard Is Operated, Type Falls into Forms at Bottom, Nearly Ready for the Presses

FORTY-FOUR ROADS HAVE AUTOMATIC TRAIN CONTROL

With his arms folded, e a locomotive engineer recently allowed his train to go past a danger signal at full speed. But no ? crash followed, for a safety control automatic cally applied the brakes, bringing the express to ?

a halt. The demonstration was but one of many similar tests that have proved the effectiveness of various safety systems, which are now installed over more than 7,000 miles of track on forty-four of the leading railroads of the country. Such equipment eventually will be universal. An order of the Interstate Commerce commission directing that the work ?

be completed by Jan. 1, 1925, was extended because of the great cost in-The total volved. expense, it is estihundreds of mil-There are lions. some thirteen dis-, tinct systems of train control, but all are aimed at the removal of the human element of error, reducing the danger of collisions and permitting trains to run with less headway, which will allow increased tonnage over given mileages without increased risks. Most of the installations are simpler than njight be sup-

posed. They make use of the tracks, signal systems and pneumatic devices already in operation. Briefly, the service of the automatic train control is to pick up the danger signal from the tracks and then operate the brakes independently of the engineer. The train may be stopped gradually or suddenly depending upon the nature of the trouble. In addition, the equipment gives the engineer a warning inside the cab in the form of three separate signals, either by lights or whistles. The first indicates that there is trouble, perhaps a mile ahead. The second tells that danger lies in the second block beyond and that the speed of the train should be reduced. The third means that the danger is immediate, probably within 2,000 feet or less, and that the train should be halted at once. If the engineer fails to regard the second signal, the automatic apparatus reduces the train's speed or halts it when the third signal is reached. If a train stops ahead, the fact is instantly relayed back to a locomotive cab as far as a mile behind. When a bridge washes out or tracks are destroyed, breaking of the circuit gives the warning.

TENT LAMP FOR AUTO TOURISTS ALSO LIGHTS GARAGE 934

As a substitute for candles or lanterns, an extension electric light for the automobile tourist is easily attached to the car, affords sufficient illumination for reading or writing in the tent and can also be used as an emergency garage or trouble lamp. The equipment includes ten feet of wire cable, a six-volt, four-candlepower bulb and a double or single-contact plug for socket insertion. A switch is provided at the base of the lamp, which is finished in black enamel or nickel.



Extension Electric Light from Auto in Tent, and Desail of Shade Switch and Cord

FIRE EXTINGUISHER IN SLING IS CARRIED ON BACK

Equipped with a cradlelike holder, a partable his extinguisher introduced in Germany can be strapped to the back or



With Fire Extinguisher Slung on Back, Hands Are Free for Carrying Other Tools

released in a few seconds. When it is taken out of its harness, it is in a position for immediate use.

"EYE" FOR ARMY TANKS GUARDS DRIVER AGAINST GAS G /8

Greater safety for the operators and increased effectiveness of the army tank are seen as a result of an attachment test-5 ed at the Aberdeen proving ground. consists principally of a stylus connected to the mechanism in such a way that every turn of the tank is indicated on a scale map of the territory being traversed. Thus, the drivers would not have to expose themselves to get their bearings by day or night and would not be so likely to suffer from gas attacks as they would betightly inclosed in the tank. The stylus is controlled by a gyroscopic compass, mounted on the rear, and is geared to the tank so that its rate of travel across the scale map coincides with the actual rate of the machine.

¶Less than twenty-five per cent of the farm land of Texas is under cultivation.

Pulata My



The Battle between the Champions of David and Saul's Son Isboseth, One of the Events Growing Out of the Suicide of Saul after His Defeat by the Philistines, as Pictured by Dore

Find Temple Dating Back to Days of Abraham

DISCOVERY which promises to be as important to Bible scholars as King Tut's tomb was to Egyptologists. has been uncovered in Palestine by an expedition from the University of Pennsylvania. The house of Ashtaroth, where King Saul's battle arm. . was hung by the Philistines after his defeat, and the wall on which they exhibited his body, as described in I Samuel and Chronicles, has been found at Beisan in Palestine, the site of Beth-Shan or "House of Security" of the Bible.

The ruins of the temple, fifty by seventy-five feet in size, are important, but of still more interest is the discovery of two ancient cornerstone deposits, pottery jars containing a wealth of ingots, rings and jewelry made of pure gold, or gold and silver mixed. Aside from their archæological worth, the finds in the two cornerstones of the temple were so numerous as to have considerable intrinsic value.

The ruins of the ancient wall of Beth-Shan, uncovered with the temple, still bear traces of fire, presumably the conflagration with which the Israelites wiped out the city when they came to avenge Saul's death and recapture his body. The first book of Samuel, after telling how Saul's army had been defeated by the Philistines and how he finally fell upon his sword and killed himself to escape capture, relates that the victors, on the following day, visited the battlefield to strip the slain, and found the bodies of Saul, his three sons and the king's armor

bearer where they fell.

"And they cut off his head, and stripped off his armour," the account continues, adding, "And they put his armour in the house of Ashtaroth and they fastened his

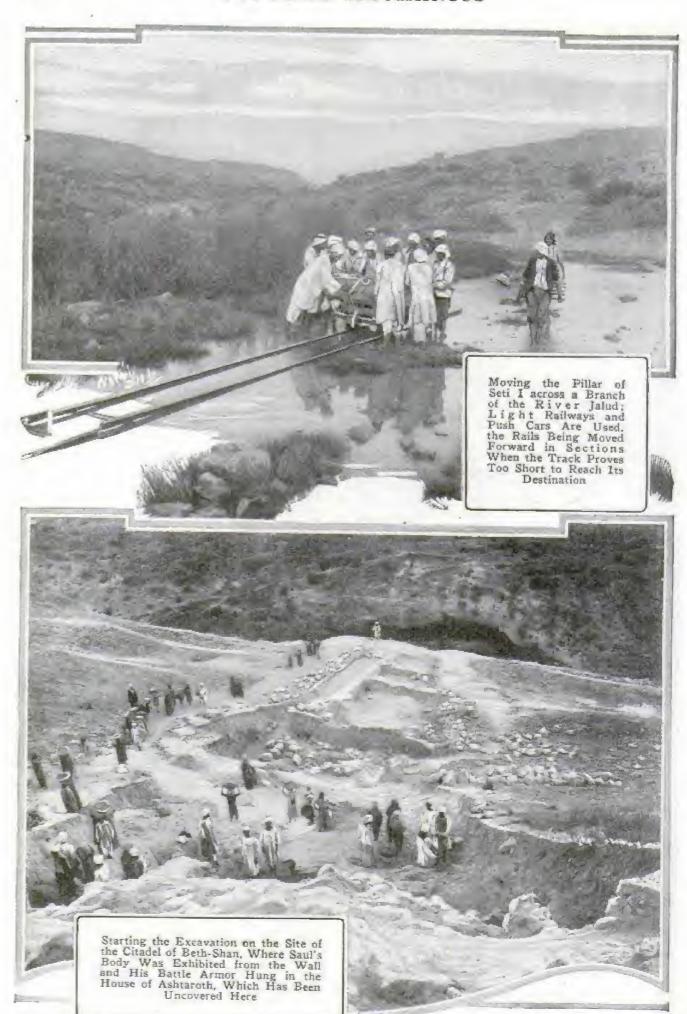
body to the wall of Beth-Shan."

To find the ancient ruins, the explorers dug down through layer after layer of earlier civilizations, and having reached the time of the Bible, discovered that still. older layers lie beneath, for Beth-Shan is one of the earliest settlements in the world. The top layer was the debris of the Arab civilization which has occupied the spot for the last few hundred years. Under that were broken utensils, weapons



Stele of Pharaoh Seti I, Uncovered by the Pennsylvania University Museum Expedition in Palestine

and other remains of the Crusaders, who held the fortress hill as a strong point



covering the valley of the Jordan while

they fought for Jerusalem.

Beneath the debris of the Christian occupation were the evidences of the Arabs they displaced, Arabs who had taken the hill during the great period of Arab conquest. Beneath that came ruins of Christian, Roman and Greek civilizations. Next were the evidences of the Hebrew conquest of 2,900 years ago, and, underneath, the Egyptian civilization which goes back there to 3,200 years ago, and still earlier civilizations remain to be explored. As a strong point of the highway between Asia and Africa the hill was a strategic position before the dawn of recorded history and was capital of the Jezreel and Jordan valleys, as well as chief city of the once famous Decapolis, or league of ten cities.

The temple of Ashtaroth, which might have gone unnoticed in history save that

the Bible linked it with the death of Saul, was erected by the Egyptians to their goddess Ashtaroth (Hathor or Astarte), about 1250 B.C., and was, so far as is known, the only pagan temple remaining intact at Beth - Shan when



Top and Bottom, Two of the Eight Memorials Erected by Moses to the Pharaoh's Daughter Who Found Him in the Bullrushes, and in Center, a Bedouin Camp it was conquered by the Philistines.

On one of the door jambs the explorers found the name of an Egyptian commandant of the city during the reign of Rameses II, the garrison commander boasting the hyphenated name of Rameses-Wesr - Khepesh. The stele of an Egyptian of the nineteenth dynasty, depicting him in prayer to his gods,

was another object uncovered near by. Adjoining it, the excavators finished removing a stele uncovered last year, on which appears mention of Kharu, the old name for the inhabitants of Canaan. The same word appears on a famous Israelite stele of King Merenptah, which is now in the Cairo museum.

Next a monument of the goddess Ashtaroth was found, showing her as wearing a long dress and the conical crown characteristic of all Syrian goddesses, with two feathers attached. Above her was written "Lady of Heaven, Mistress of all the Gods."

The room of the first of the three temples in which the stele of Ashtaroth was discovered had four stone drums concealed under its floor of hard clay, which were thought to have once been the foundation for wooden pillars. The room was littered with cult objects, many of

types never before discovered.

Beneath the nineteenth-dynasty temple was found still a third temple of Egyptian origin, thought to date from the fifteenth dynasty, or about 1500 B.C. An altar and a scarab from King Thotmes III's times were found here, and the floor of the temple still retains its bright blue color despite the passing of more than thirty-four centuries.

Still farther down another temple of

Ashtaroth has been uncovered, and in it was found a golden i mage of the god-

Native Workers
Removing a Byzantine Column
from One of the
Temples Uncovered in Palestine; the Column Was
Brought to
America

dess. As the temple of Saul's day was in existence at about 1000 B.C., it is believed that this earlier shrine may date back to the days of Abraham, or around 2000 B.C., when it is presumed to have been a worshiping place for the Canaanites and the Philistines. The presence of the gold image and the workmanship indicate that this earlier temple was built by an even more powerful and skilled civilization than that of the days of Saul and David.

The region in which the university is working is one of the most fertile fields for exploration remaining. For centuries it was closed to outsiders by the Arab and Turkish rulers, and not until England took over the administration of Palestine under a League of Nations mandate could a permit be obtained to open the famous hill. As a result the ruins remain untouched. The region is famous in bible history for many reasons. It was

near this site that David slew Goliath, and around about the adjoining valleys of the Jordan and Jezreel, some of the most stirring exploits of Old Testament history occurred.

One result of the Turkish rule was the protection of the site of ancient Beth-Shan from molestation, since, some fifty years ago, it became the private property of the Sultan Abdul Hamid, preventing any haphazard digging by natives in search of valuables. The reputation of the place for excessive heat, a deadly climate, and a population said to be knaves and thieves, likewise served to keep visitors away. The university expedition has found climate and natives easy to guard against, and for three years has carried on the work in the heat of summer.

The mound on which the excavation has centered, represents but a small part of the vast extent covered by the city in Roman and Byzantine periods, but does embrace the great acropolis of those days, as well as the whole extent of the walled city of the Canaanites. The first test trench went down through the various

of thirty-six feet, the ledgehandled jars of the early Bronze Age, about 2000 B.C., were uncovered. To trace the development of

layers of civilization until, at a depth

such a superimposed series of civilizations, it is necessary to remove each complete stratum from the entire site in its turn. It took three years in this way to go down between twenty and thirty feet, through eight successive building periods, and reach the brick fortress of the time of Seti I, who ruled Egypt from 1313 to 1292 B.C.

The Egyptian fortress of the Pharaoh Seti had a fairly regular plan, with groups of small chambers and long corridors surrounding open courts. The walls, which in some places still stood to a height of nearly ten feet, were built of large bricks of sun-dried clay, measuring twenty-one by fourteen inches and six inches thick. They were laid in mud mortar, and the faces of the wall were finished off with a fine mixture of clay and lime. The floors had a thick coating of cement laid over a bed of rubble. From one corner, adjoining what appeared to be the main court, a brick staircase led either to the roof or to an upper story. The main entrance, which had been partly destroyed in placing the foundation of later buildings, still showed the great sill and side jambs, all of carefully dressed and fitted blocks of basalt which dovetailed into the brick masonry of the main walls on either side, showing a high degree of workmanship.

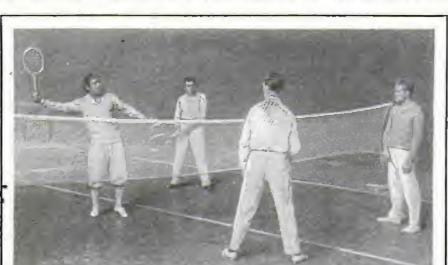
Two commemorative steles, or wall plaques, of Seti I and Rameses II, together with a seated statue of Rameses III, all of basalt, featured the main court of the fort. The stele of Seti shows him as a young man wearing only the short skirt and headdress making an offering to Horus. After a long preamble, the text cut below the figure gives a brief account of the campaign of the first year of the pharaoh's reign, in 1313 B.C. One day a messenger came to Seti, according to the text, from the city of Beth-Shan requesting aid against the "vile one" of Hamath, who had formed a league with the men of Pella, a city just across the Jordan from Beth-Shan. Already they had shut up the chief of Rehab in his city. which lay a few miles to the south and was one of the "sister" cities of Beth-Shan. Seti, at the time, was at Megiddo marching in a campaign against Palestine and Syria. He was resting his army there at the western end of the valley of Jezreel before attacking the Hittites, and seized the opportunity to clean up this local disturbance at Beth-Shan on his way. The stele explains that he sent the division of Ra to occupy Beth-Shan and the division of Amen to attack Hamath, while the division of Sutekh was sent toward the southern foothills of Lebanon as a demonstration to keep the Hittites off the flank of the main army. Seti's fourth division, that of Ptah, is not mentioned, but the explorers presume it was left at Megiddo to guard the road back to Egypt. The inscription concludes with the statement that the conflict was "finished in one day" with a complete victory for Seti.

The change in ownership of the Holv. Land after the war has opened up the entire field for intensive study by archæologists, but finds made before the war are still being examined and identified in museums throughout the world, for the work of translating ancient picture writing proceeds slowly. Announcement was recently made in Germany that eight stone tablets, found in 1905 by Flinders Petri in the ruins of an ancient temple on Mount Sinai, were stone records written by Moses. One of the tablets bears a letter of thanks sent by Moses to Hatshepsut, queen of Egypt, for saving him from the river Nile. At the time the tablets are supposed to have been carved by Moses' order as mementos to the queen, he had been promoted to the highest position in the Egyptian temple.



TENNIS IS PLAYED WITH CORKS ON INDOOR COURT

The venerable game of "badminton" has been developed into a strenuous sport



Douglas Fairbanks and Associates Playing the Cork Tennis Game in a Motion-Picture Studio Building; the Net Is Four and One-Half Feet High

that Donglas Fairbanks and others have found nearly as valuable as tennis for keeping in condition. It is played indoors on a court twenty-four feet wide, fifty-four feet long and without the side alleys. The net serves the same purpose as in tennis but is of a finer mesh and is four feet and a half high. Instead of balls, large corks wrapped with friction tape and with five feathers firmly inserted in them are used. Score is kept as in regulation tennis. Winged corks are being devised so that the game can be played out of doors. The feathered missiles, it was found, were too light to carry true in a wind.

LARGEST SEMIRIGID DIRIGIBLE CHRISTENED IN SNOWSTORM

Circling over Scott Field, near Belleville, Ill., for nearly an hour in a light snowstorm and an eleven-mile wind, the RS-1," the world's largest semirigid dirigible, recently completed a successful trial flight. The big bag, the first of its type to be built in this country, is 282 feet long, has a capacity of 755,500 cubic feet and is propelled by four 300-horsepower Liberty motors. It is the second largest dirigible in the United States, the Los Angeles being the biggest. An average speed of forty miles an hour was maintained during the test, which was conducted by Lieut. Orval Anderson and a crew of eight men. According to Lieut. Col. Paegelow, commanding officer, plans are under way for the erection of a mooring mast.

INVENTIONS OF RECENT YEARS SHOW GREATEST PROGRESS

In the last twenty-five years, man has outstripped all other periods in the num-

ber and kind of his inventions and their practical application. A quarter of a century ago, no one had heard of the radio, submarines, war tanks, machine guns, airplanes and wireless telephones as articles of almost daily service. The world then was doubting Marconi and the little group of men who believed in radio, while experimenters with airplanes were tolerated as a musing "cranks." Today, the roar of the mail planes daily is heard over the route of the old Pony Express, armies of the

world fight in the air, and it is becoming the great highway for peace-time travel and shipping. Important applications and changes have been made in old inventions. The reaper, for instance, was known nearly a century ago, but only in the last twenty-five years has it been combined with the thresher. Motion pictures, relaying photographs by radio, the use of radium and the X-ray are achievements of the present century.

BOTTLE STOPPER THAT LOCKS THAS REMOVABLE KEY

Bottles are secured against tampering with a stopper that has a separate key to



expand two
pieces of metal
against a rubber
section, wedging
it to the neck. A
reverse turn of
the key releases
the pressure so
that the cork can
easily be removed.
The stopper is
readily identified
by touch, enabling
a person to select

the proper bottle even in the dark, and preventing accidents.

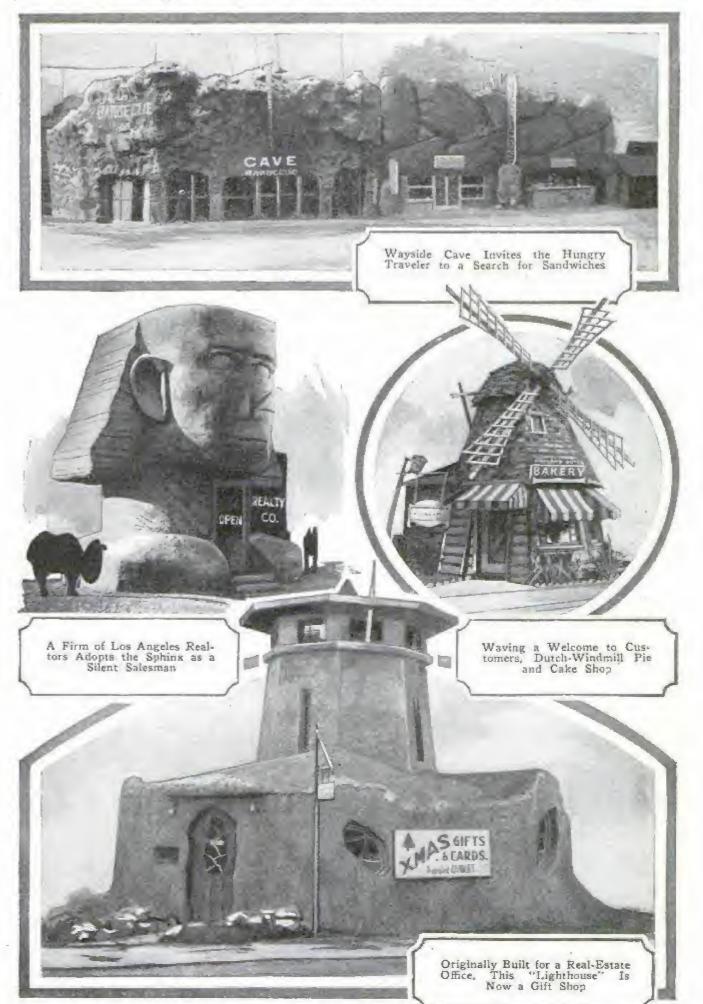
During the last six months of 1924, the world used 6,232,000 bales of American cotton.

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Cut.

Herald Tribun

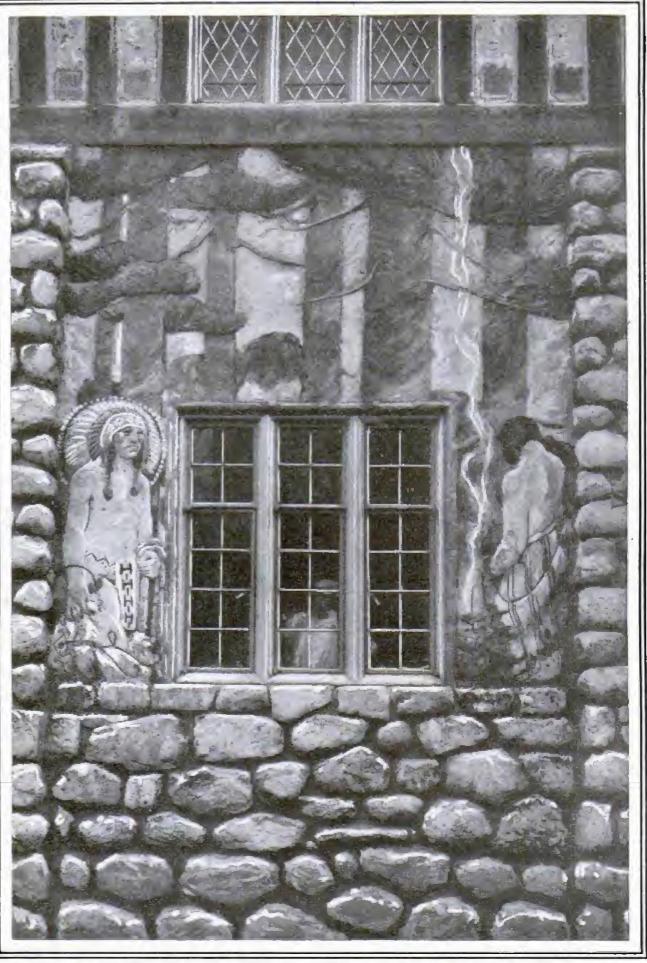
Unique Places of Business in West



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An Indian Scene in Many Colors, One of the Unusual Cement Paintings Decorating the Unique Courthouse at Midland, Michigan, Where an Artist Has Used Colored Ground Glass as Pigment

FORTER MECHANICS

Colored Glass Used to Paint with Concrete

SING colored ground glass as his medium, Paul Honore, a Detroit artist, has recently "painted" some vivid murals on the outside walls of a new courthouse at Midland, Mich., that promise much for American exterior decora-Visitors have come from as far away as Florida and California to study the new material, and if their spoken inc tentions are any indication, similar colorful structures will soon be scattered over the country.

The big point about colored-glass cement is that it is lasting. Never will the richness fade from Honore's pictures of the pioneers of Midland county. Centuries from now, if the building is standing. visitors will still have their retinas tickled? by the ruddy splendor of sunsets blazing on the walls, the gaudiness of woodmen's mackinaws and bandannas and the crazyquilt riots of colors shown in Indian head-

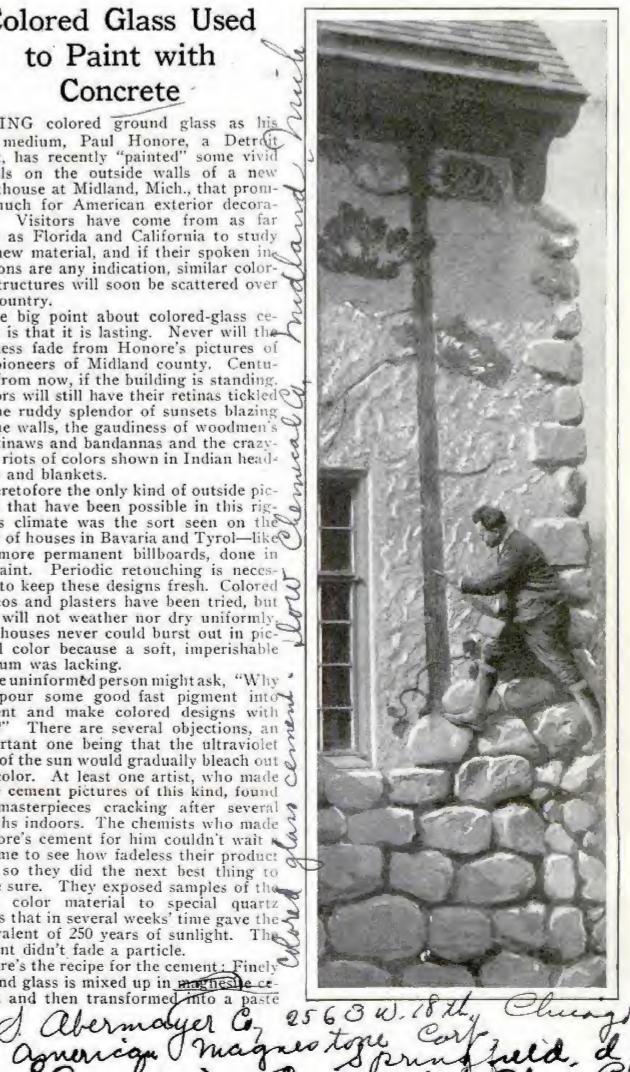
dress and blankets.

Heretofore the only kind of outside pictures that have been possible in this rigorous climate was the sort seen on the front of houses in Bavaria and Tyrol-like? our more permanent billboards, done in oil paint. Periodic retouching is necessary to keep these designs fresh. Colored stuccos and plasters have been tried, but they will not weather nor dry uniformly Our houses never could burst out in pictorial color because a soft, imperishable

medium was lacking.

The uninformed person might ask, "Why" not pour some good fast pigment into that?" There are several objections, an ? important one being that the ultraviolet rays of the sun would gradually bleach out & the color. At least one artist, who made some cement pictures of this kind, found his masterpieces cracking after several months indoors. The chemists who made Honore's cement for him couldn't wait & lifetime to see how fadeless their product was, so they did the next best thing to make sure. They exposed samples of the glass color material to special quartz lamps that in several weeks' time gave the equivalent of 250 years of sunlight. The cement didn't fade a particle.

Here's the recipe for the cement: Finely ground glass is mixed up in magnestle cement and then transformed into a paste





Paul Honore and One of His Ground-Glass Paintings on the Walls of a Novel Stone, Stucco and Timber Courthouse in Michigan

by the addition of liquid magnesium chloride. The artist applied the material with a small trowel, like a putty knife, any-

where from one-eighth to one-quarter inch thick. The mixture sets in about four hours. When dry, both its feel and its appearance at close range remind one of the surface of a grindstone. Visualize a slab of colored sandstone, and you have a good idea how the material looks.

Mr. Honore explained why the color was so permanent. "Old paintings and tapestries have retained their color for centuries," he said, "because they were kept in houses with glass windows. That is to say, solar light, before it reached them, was robbed of its destructive rays by the glass. Glass screens off the ultraviolet rays.

"The color in my murals is imprisoned, so to speak, in sun-proof grains of glass.

The bleaching rays can never reach the pigment. Glass cement is also immune to gases and acid fumes that float through the air in a chemical-manufacturing town like Midland. In addition to these lasting qualities, the new cement also has non-cracking features to commend it."

There is something else quite noteworthy about that Midland building. So far as is known, it is the first courthouse ever built entirely out of materials gathered in the county erecting it. Hardware is, of course, excepted.

When Herbert H. Dow, of Midland, offered his idea of what the new courthouse should be like, he proposed an American design—not a Grecian temple with a blindfolded statue of Justice in front or on a dome. Furthermore, it was to be constructed of the field stone of the district, of plaster made there and timbers hewn there. Once the building started, almost every farmer contributed at least one load of stone so that the courthouse even has sentiment mixed in its mortar, so to speak.

With this aim of a home-products and home-folks building in mind, the other problem was to get a design that would be appropriate. Bloodgood Tuttle of Cleveland, the architect, was told to design a building that would fit in and yet stand out. He chose a modified Tudor style. Honore was commissioned to cli-

SPECIAL CONDENSER ON ENGINE REDUCES WATER WASTE

Designed by a Swedish engineer for the Argentine railways, a locomotive of the turbine type is equipped with a special



A "Camel" among Locomotives; Condenser Engine Designed by a Swedish Expert for the Railroads in Argentina Where Long Runs Must Be Made without Watering Places

max the whole project by depicting on the walls the life and surroundings of the original home folks of the county, the first settlers and their red-skinned neighbors. The plan of making the building entirely a home affair was carried to the extreme of turning the first sod with a spade of magnesia metal, a substance derived from the brine that oozes through the Midland county sands.

Chemists did the research work that led to the new medium. They began with stuccos and cements. When they hit on the ground-glass idea, they still had a lot of work ahead of them in determining what "mesh" of ground glass was best, and other technical details. But now that the process is perfected, a new plastic medium is at public disposal for a variety of uses. Lamp stands, window boxes and molded decorative articles of all kinds may possibly be fashioned from it.

SPRING CLAMP ON ASH TRAY PREVENTS TIPPING OVER

To hold the ash tray in a convenient position and to keep it from upsetting, a rubber-covered spring clamp is adjustable to tables, desk, chairs and other objects. It is securely fastened to the hold-



er with a wingnut, and has a specially constructed arm to keep the tray upright. The clamp is useful also on trains. condenser unit between the tender and the engine proper, so that it can cross long desert stretches with a minimum of water consumption. The tank is of unusually large capacity, and the drain on it is partly replaced by the condensed steam flowing back from the locomotive through the reclaiming apparatus.

SHIPS BUILT WITH SOFT BOWS TO INCREASE SAFETY AT SEA

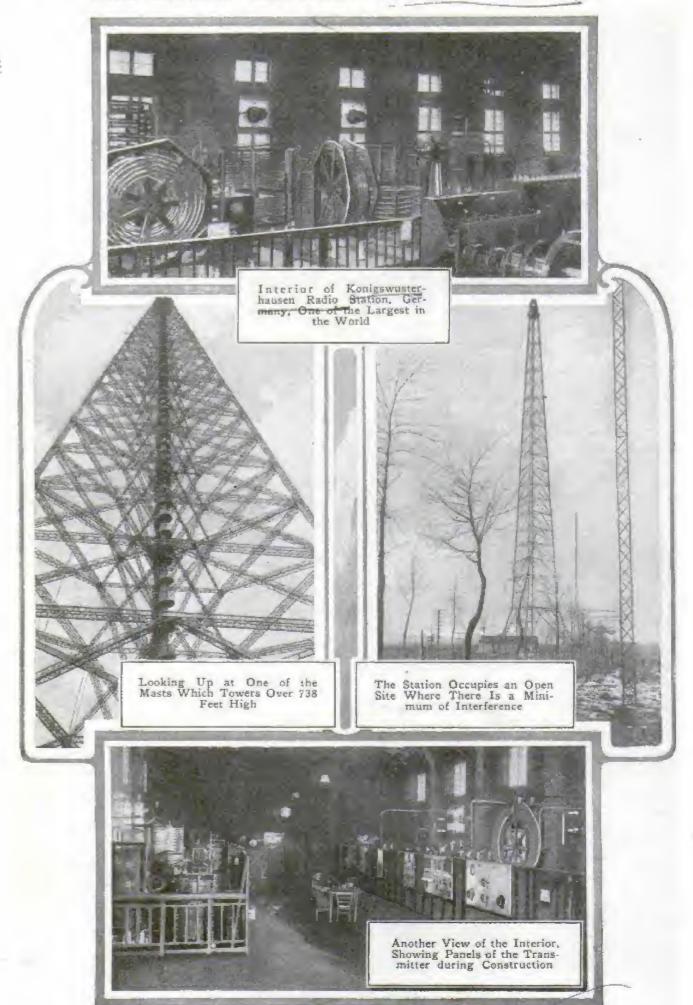
With vertical instead of horizontal plates at the prow, vessels could be constructed so that they would not be likely to sink other ships in case of a collision and would be proof against serious damage themselves, according to E. F. Spanner, a British marine architect. He has produced figures to show that a boat of this soft-ended type, should be able to run head-on at ten knots an hour into a solid wall without rupturing the first forward hold. He believes that the vertical plates would yield sufficiently under the impact to take up the force of the collision, thus preventing the shock from reaching other parts of the ship. The soft prow would be built forward of the collision bulkhead. Other ships, from the largest liners down to those of only 150 or 200 feet in length, would also be protected from serious damage, Mr. Spanner states, assuming they were of ordinary seagoing steel construction, as the plates would be dented only instead of being cut through, and repairs would be less costly.

Timber losses caused by boring insects amount to approximately \$40,000,000 every year.

Lindon

16/26

The Latest German Wireless Station



SENSITIVITY OF RADIO TUBES NOT DETERMINED BY LICHT

Contrary to popular impression, the amount of light given off by a radio tube

is not an indication of its sensitiveness or general condition, according to The research engineers. fact that the tube emits light at all is only incidental to its operation, and in some, a manganese coating on the glass permits only a slight amount of light or none at all to penetrate, so that the illumination test is practically worthless so far as indicating how well the tube is functioning. What is desired in the tube is a flow of little particles of electricity, the electrons or negative charges. The easiest way to obtain this action is to heat certain kinds of wires in the glass bulbs from which the air has been exhausted. To make the flow abundant, the temperature must be quite high, and this is done in actual operation in the radio set

by current from the A-batteries. The wire becomes incandescent under the heat and naturally emits light as a result, but the light itself has no connection whatever with the actual working of the tube.

STEEL COTTER-PIN PULLER HAS JAWS THAT LOCK 9 50

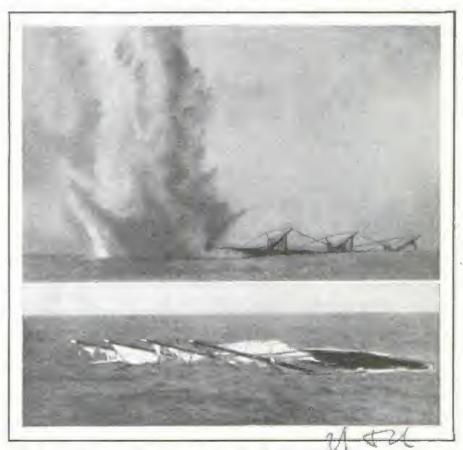
Removal of cotter pins is simplified by the use of a steel puller operated like a

pair of pliers. When the handles are spread, the jaws are forced out of a steel housing, and a lug on the upper jaw throws the m open to engage the pin. Closing the handles pulls the jaws back into the case and, at the same time, locks

them on the pin, reducing the likelihood of slipping and also preventing the pin from dropping out and being lost.

RIDDING THE SEA OF DERELICTS AT PERIL OF SAILORS' LIVES

Removing the hulks of wrecked ships from the sea lanes, so that they will not be



Clearing the Sea of a Derelict; a Mine Exploded under a Floating Wreck of the Schooner "James W. Howard"

a menace to navigation, is one of the perilous duties that falls to the coast-guard service. The task cannot be attempted in stormy weather as high waves make boarding the wreck extremely difficult and placing the charges of explosives with which to shatter the derelict, dangerous. Mines are usually attached to the wrecks and exploded by electric contact from a safe distance. In blowing up the schoon-er "James W. Howard," of Boston, as shown in the upper photograph, the coastguard cutter "Modoc" had to wait several days after the wreck until the sea became sufficiently calm to permit small boats to be sent over for placing the mines. The job was only half finished when a heavy southwest storm approached, driving the wreck out of the path of coastwise shipping and compelling the "Modoc" to leave.

The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described will be promptly furnished by addressing the Bureau.

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In the Grand Palais in Paris workmen are reconstructing from numbered pieces a "perfect home," erected, torn down and transported across the ocean from the United States. It will be the chief American exhibit at the International Exhibit of Household Appliances and Labor-Saving Devices.

The house represents the combined opinion of leading architects, interior decorators, electrical experts, and others, as to what the perfect home should be. It is of early colonial design, two stories high, of U-shape, with two wings form-

ing a courtvard between them.

It is the interior equipment, however, that is expected to astonish the French housewives, to whom many of the every-day electrical and mechanical household appliances used in this country are unknown. The kitchen and laundry in particular are expected to make them rub their eyes. The vacuum cleaner, wash-

ers, electrical refrigerator with its arrangement for delivering cubes of ice for table use, and numerous other electrical devices are still curiosities in most sections abroad. The laundry equipment includes white-enameled tubs and washing machine, electric ironer and a hand iron for more delicate work. The polisher for the floors has an electrically driven revolving brush. The hot-water heater works automatically, and for the table there are a number of electrical devices? including a silvered coffee machine, toask er and waffle maker. The rooms are lighted by softly/shaded table and floor lamps, as well as wall sconces and overhead chandeliers. All the furnishings and decorations are accurate reproductions of ? early American designs, some of which were copied from original pieces in the American Museum. Upstairs the same electrical motif is carried out, There is a

Westinghouse C





POPULAR MECHANICS Theating pad and an electrico? violet-ray machine, as well as a massage device. Even the fireplaces have electric fires, supplemented by portable heaters. Prooms and four baths the same completeness of equipment has been carried out. After the exhibition closes The house will be presented Sto some Frenchman, selectsed by the French govern-c ment for the most notable contribution to humanity in recent years. It will be taken apart for the second Time, and finally erected permanently on the site chosen by the recipient. The house attracted thous sands while it was on display in Brooklyn. Above Is a View of the Hall, Showing the Wall and Table Lights, and beneath It, a Tele-phone Recess with Bell Box Hidden in Wall



CROSS-TIPPED MARBLE TAPERS HONOR WAR DEAD

In memory of Italian heroes who fell in the World War, a monument in

"Tapers" of Marble Erected in Memory of Italian Heroes of the World War

the cemetery at Parma suggests three tall candles set in a triangular base and each capped by a cross. Names of the soldier dead are seen on the foundation.

PENSIONS PAID BY U. S. YEARLY
TWO HUNDRED MILLIONS

More than \$200,000,000 is paid yearly by the United States to the survivors and to widows, helpless children and other dependents of soldiers of the wars. Since 1790, when the pension system was started. this country has paid out over \$7,000,000,000 to such persons. According to official figures, the World War \$24,610,000,000, and since the signing of the armistice, \$1,371,645,477 has been expended for pensions. There are now 512,-537 pensioners on the government rolls, as compared with 525,539 during the fiscal year of 1924. It costs about \$1,500,000 a

year to maintain the system, although the total amount expended yearly is growing smaller. Nearly \$6,500,000,000 has been paid in pensions as a result of the Civil War, which cost \$4,500,000,000.

SALVAGE TONS OF OLD RUBBER TO COMBAT HIGH PRICES

/011 The capacity of American plants for recreased since the imposition of high prices, due largely to the British monopoly, and it is estimated that no less than 400,000,000 pounds of rubber will be salvaged during the present year, to be used in place of the plantation product. In 1924, when the cost of raw rubber was thirty to thirty-five cents a pound, this country produced nearly 170,000,000 pounds of reclaimed material. The government estimates that American industries will need 900,000,000 pounds of rubber this year. Cultivation of a plant that yields rubber is being developed in Texas and other southern states as another means of meeting the situation. Perit /2/27/26

WALLS IN RUSSIAN FACTORIES DISPLAY NEWSPAPERS

Workers in some of the factories in Moscow, Russia, have but to look at the walls of the buildings to find out the latest happenings, for newspapers, lettered in legible bulletin style, are posted in conspicuous places. The sheets are prepared in inks of various colors and much of the printing is done by hand.

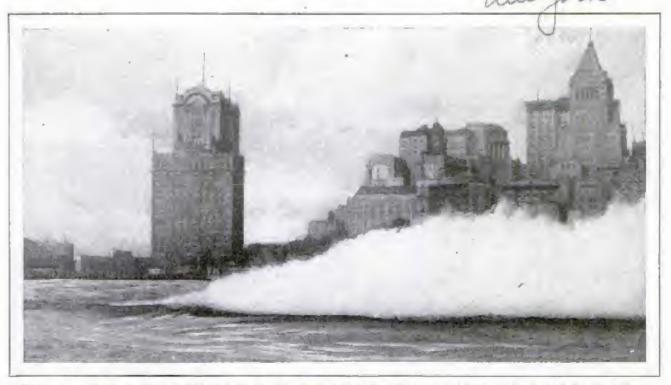


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POPULAR MECHANICS

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Taken an Instant After Submarine Charge of Dynamite Was Exploded; Column of Mud and Water Rising from New York Harbor during Blasting to Widen the Channel

BLOWING UP NEW YORK HARBOR TO WIDEN CHANNEL 958

Tons of dirt and water leaping in a sudden gush from the placid surface of New York harbor gave spectators a thrill recently as engineers started blasting the bottom to widen the channel near Governor's island. Each charge contained 500 pounds of dynamite and twenty-four hours were required to set it off.

FOUR-FIFTHS AS MANY HOUSES AS FAMILIES IN U. S. 949

In spite of the rapid increase in the number of flats and apartments, there are more than 20,000,000 dwellings to house about 25,000,000 families in the United States, a recent survey shows. By family is meant a group of people, not necessarily related, who live as one household and eat at the same table. However, there are several states that have a separate dwelling for every family, and even in more congested sections, the ratio is not so unbalanced as might be supposed. In Illinois, for instance, there are only about forty per cent more families than dwellings, and in New York state only twice as many families as dwellings. Philadelphia upholds its reputation as a city of homes, the number of which is only ten per cent less than the number of families. In crowded New York City, there are about four times as many families as dwellings. The size of the average American family is found to have intreased slightly in the

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last few years, but there is an average of only six persons to every dwelling the country over, including the large apartment buildings in the cities.

"LOSE A MINUTE, SAVE A LIFE" WRECKED AUTO WARNS 925

Its days of running service over, a wrecked auto in Lincoln, Nebr., has been placed at the curb of a downtown street as a warning against careless driving. The message is summarized in a safety slogan, "Lose a Minute, Save a Life."



Wrecked Auto and Cross Sign, Silent Advocates of Safety, Displayed on Sidewalk at Lincoln, Nebraska

Jora Jimes



Nothing in the Picture Indicates It, but This Scene Is Painted on Cobwebs

ARTIST PAINTS ON COBWEBS INSTEAD OF CANVAS

Filmy cobwebs, so delicate that a puff of wind may destroy them, are used by a peasant artist in the Tyrol as a substitute for canvas. He paints a variety of scenes in colors on the material, which is so thin that the picture is practically as distinct on one side as on the other. In spite of precautions taken to protect these pieces, they are likely to be torn and collectors guard them with great care.

PHONE CALLS READ BY CAMERA FROM AUTOMATIC COUNTER

Development of the automatic-telephone system has necessitated two ingenious aids, an automatic counter which keeps a record of calls made and a camera to read the totals every month. Each subscriber's line is connected to one of the registers, which are set row upon row in panels behind tightly locked, dust-proof glass doors. In a machine-switching station, when a receiver is lifted from the hook, a mechanical "finger" goes "feeling" up and down an intricate device until an empty wire is located for the subscriber, the familiar "dial" tone is sounded, and the connection can be completed by turning to the proper numbers, if the

line is not busy. When the conversation is finished and the talkers hang up, the automatic register clicks a record of the call. With the special camera, these registers can be read once a month in a fraction of the time required by the old method, which generally took two persons working all night, one to read the numbers and the other to record them in a book. The camera contains sufficient film for seventy exposures and fits tightly around a section of six registers. Inside . the instrument's hood are small but powerful electric lamps to illuminate the numbers recorded on the register. The exposed films are forwarded to a central mechanical department where they are developed and printed, and the long, narrow strips are distributed to the proper accounting offices. The developed film gives an absolutely accurate reproduction of the totals, which are entered upon special cards so arranged that they form a continuous record for a whole year and from which the number for the month can be computed almost instantaneously.

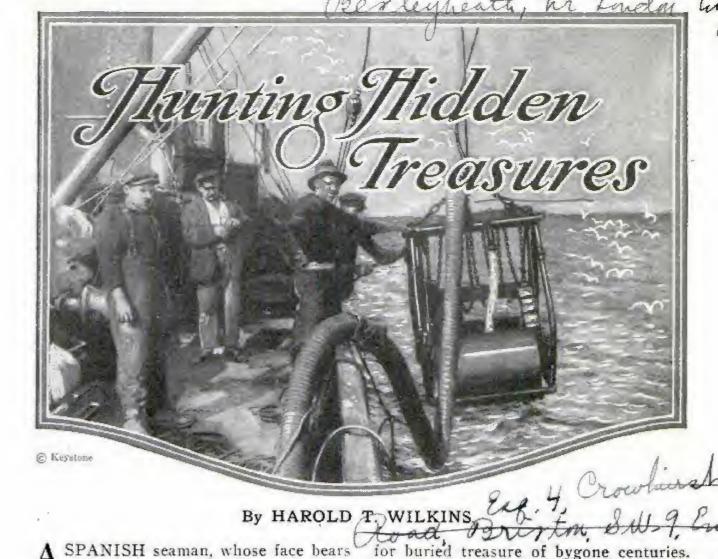
CANE_HOLDS FOLDING TABLE FOR PLAYING CARDS

Constructed like an umbrella, a small folding table, top, legs and all, can be placed inside a walking stick, which also collapses for carrying in the pocket when not in use as a cane. The table is well braced and is of the tight height to permit players to use it comfortably when seated.



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A SPANISH seaman, whose face bears a sinister scar, is dying of yellow jack in a plague hospital somewhere in the West Indies. Touched by the kindness of another patient, he beckons and whispers in his ear the secret of a chart. marked with mysterious crosses, anchors

and other symbols.

"If you take your bearings from this chart, your fortune is made." He dies; the other seeks out a man of means and adventurous spirit. A syndicate is formed, a ship chartered, and it is sailing to the Spanish Main with picks and shovels to dig up the shining sands of a pirate cove. The treasure is, or more likely is not. found. That was the old-time treasure quest—true to fiction and even to real life.

Today, the quest is organized on scientific lines. An exploration ship, sent out by a learned society, calls, in passing, at some lonely outpost in the South Seas, whose cliffs and caves are known to have been the "bank" of a buccaneer or lesser piratical marauder. Syndicates, with plenty of capital, press into the quest the latest devices of modern engineering. They drain away lakes, blast mountains to pieces and pile up earth in thousands of tons by the aid of steam shovels, to search

for buried treasure of bygone centuries. Sometimes it is found, but oftener fate and chance take a hand in the game.

An American girl diver, Miss Jean Tolley, was recently acting a part in an underwater film, in Nassau harbor, the Bahamas. She dived deep and saw on the sea bed the handle of an iron chest sticking out of the sand. It was hauled up to the yacht from which she had dived, and the astonished performers pried open its sides, when a heap of Spanish doubloons, bearing the date 1790, rolled onto the deck. There were many thousand dollars' worth of them. The British government put in a claim to the treasure trove, and it was deposited in the vaults of the Royal Bank of Canada, pending a law suit.

Bank of Canada, pending a law suit.

In August, 1925, an American was searching the ancient ruins of an underground chapel at Torres Junction, Sonora, Mexico, armed with a chart given him by a Mexican woman, in whose family the document had been handed down for generations. He unearthed among the ruins three bags of seventeenth-century Spanish gold coins and ten bars of silver, valued

Far away in the Philippines, at Calumpit, near Manila, American soldiers are searching for the great hoard of Spanish gold buried 160 years ago by a Chinese mandarin when the British captured Manila. The finest string of pearls in the world is said to be hidden somewhere in these swamps.

The buried treasure of Sir Henry Mor-

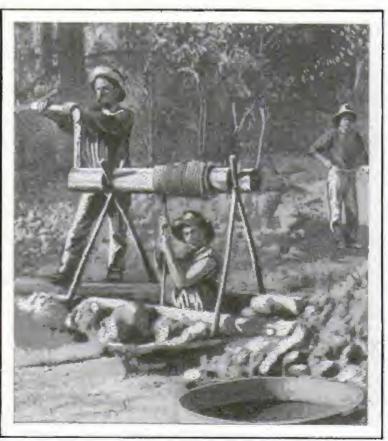
gan, the famous buccaneer of the Spanish Main, whose "bank" was in the lonely isles of the Caribbean sea, is being sought for by Bernard Keegan, the famous American deep-sea diver and second mate of the wrecking tug "Favourite," of the Panama canal. Tradition says the treasure is hidden in a sunken cave. The mouth of the cave, above water in Morgan's day, is now seventyfive feet below the surface of the sea. An

authentic treasure still waits to be found in the Panama Canal Zone. Somewhere in the woods which adjoin the old Camino Real, or royal treasure road to Nombre de Dios, are buried great loads of silver captured by the English buccaneer, Sir Francis Drake, and his sea rovers from the Spanish treasure bands, bound to Panama City. They hastily buried 57,000 pounds of silver in expectation of a return which

was never made.

A remarkable story of scientific discovery is that connected with the drilling for the head of the vast meteorite imbedded in the soil in Arizona. Many experts and engineers recently attacked this body, which hit the earth many years ago. The ancestors of the Navaho Indians appear to have seen this comet strike the earth. This meteorite is 300 feet in diameter, lies 1,400 feet below the present surface, and is so hard that it blunts the edges of the finest-tempered steel drill. It is thought to be worth \$50 a ton as it contains microscopic diamonds, platinum,

iridium, nickel and pure iron. Hundreds of thousands of dollars and the wits of the cleverest American engineers and college professors have been vainly spent in trying to solve the mystery of the Money Pits of Oak island and its sheltered haven, Mahone bay, Nova Scotia. Three young



Working a Sapphire Mine in Australia; Simple Methods Still Prevail, Windlass, Pick and Shovel Being Widely Used

men once landed there with canoes and explored a grove of oaks. They found a clearing in the center of which was a large oak, scarred and blazed with an ax. A rough derrick appeared to have been attached to a lower, sawn-off limb, and block and tackle used. Beneath. some twelve feet in diameter, was a circular depression in the earth. The tide in the cove was low, and, prospecting around, they soon found a ring-

bolt, apparently a mooring place of bygone days. A copper coin, dated 1713, and an ancient boatswain's whistle were found.

Then the men dug down into the clearing beneath the oak, and found a shaft in which they could discern the work of other picks and shovels. Twenty feet below the surface, they uncovered thick planking, and ten feet deeper, a timber bulkhead. None of the natives would help as they said ghostly flares had been seen at night in the cove. Numerous attempts were made without success, to solve the secret of the pits, the most scientific being in the twentieth century when a syndicate sank 20 shafts in a ring around the pits, and bored a network of tunnels. About 126 feet below the surface, the drill encountered a piece of iron past which the incasing pipe could not be driven. smaller auger was used, and thirty-three feet lower, it struck a layer of cement, seven inches thick, covering oak. Beneath was some soft metal and the drill brought to the surface a small fragment of sheep-

POPULAR MECHANICS



skin parchment upon which had been written in ink the syllable "wi." Wood and iron were also raised, but the soft metal, presumed to be gold, did not cling to the auger.

It was supposed that the layers of planking were treasure chests. During the borings, seven chests or casks were met with, but it seems most remarkable that any pirates or buccaneers acquainted with the parchment, yellow with age and bearing an inscription in French. It directed him to go to a certain spot where he would find "buried in plaster, burnt wood, plate and ingots of silver, and a sheep's skull. Beneath is the secret of great treasure." He and his son dug deep at the spot indicated, and found the odd collection of articles together with a rusty iron-bound box. Inside was a chart in old French.



Where Precious Metal Is Handled like Common Freight; Piles of Silver-Lead Ingots on the Whati at Port Pirie, South Australia

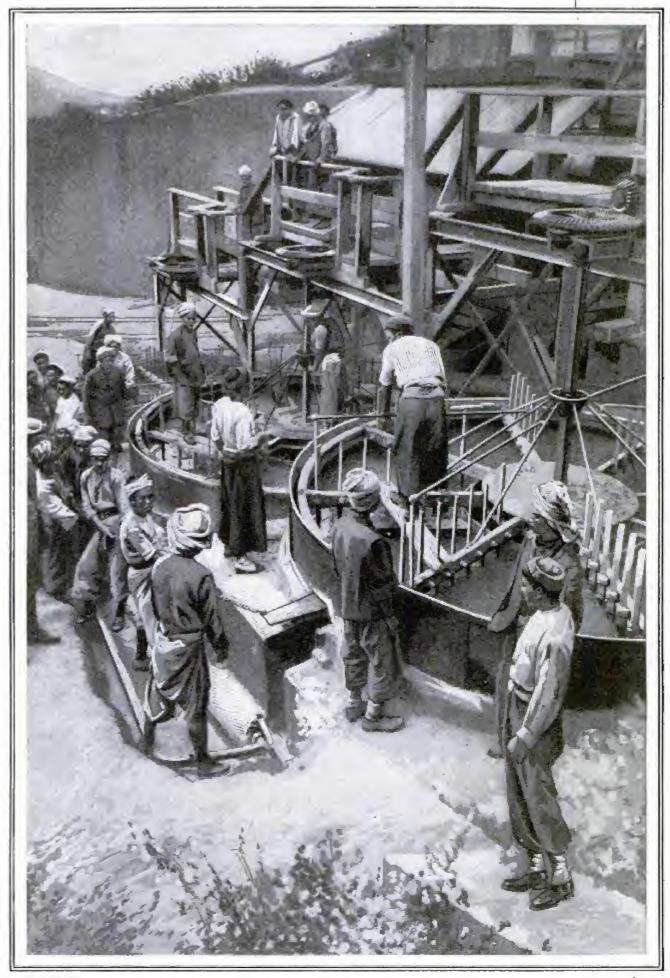
American coast should have gone to the astounding length of digging a hole over 160 feet deep, connecting it with the sea by an underground passage, and guarding it with layers of cement and timber. The syndicate sank a cofferdam near the ringbolt and found drains, but a high tide rose and overwhelmed the dam. Hosts of engineers, equipped with the latest appliances known to mechanical science, have attacked these baffling pits, but in vain.

A vast treasure of gold doubloons, louis d'or, and grand seigneurs' family jewels from old chateaux in Quebec and France, awaits some lucky searcher on the land of a Catholic church in a little bay on the river St. Charles, near Quebec. It is known that Montcalm, in 1758, ordered all this treasure to be sewn up in hides and pigskins, deposited in brass-bound coffers, and taken in boats up the St. Charles river. All trace of this treasure vanished until the twentieth century, when a French habitant of an old chateau near Quebec found a small silver box in a cavity at the back of his fireplace. It contained a small

and the following: "Across the river St. Charles to the wood near the small bay and peninsula. Twenty feet NNW by N, toward a clump of firs. Fifty feet as the sun sets. Five feet deep and set in plaster, our great treasure out of the citadel."

The land on which the treasure now lies being church property, the two men dug secretly at night. They found nothing because the clump-of-firs clue was rendered useless by the growth of a large wood. The search was abandoned.

Some 600 miles southwest of Panama, in the Pacific, is far-famed Cocos island. Every year sees some ship sailing through the Golden Gate of San Francisco or past Long Island bound to this siren rock. Every year closes its eyes upon some baffled expedition creeping back to the home port. In September, 1925, the English yacht "St. George," sent out by the Scientific Research association, returned to England, after touching, among other places, at Cocos island. They searched for, but found no treasure on it, though there is said to be buried some twelve mil-



© U. & U.

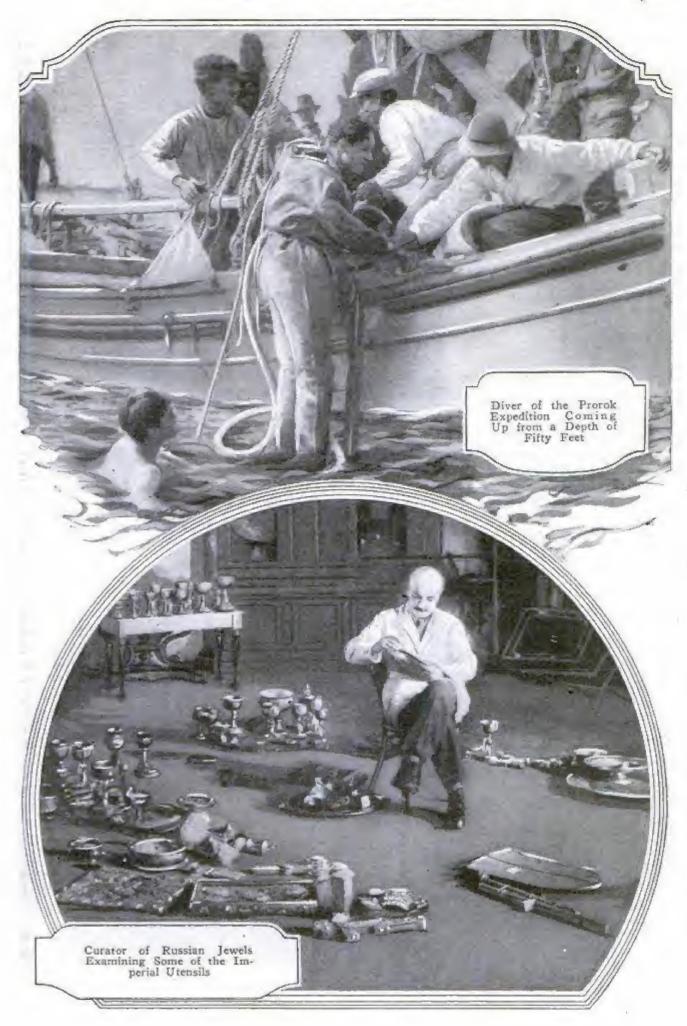
Elaborate Apparatus Used in Burma to Wash Gravel in Search of the Most Precious of All Gems, the Ruby;

Fine Specimens Are Valued Much More Highly Than Diamonds



Seascope; Washing for Rubies, and Using Divining Rod

each new chieftain or Indian cacique cov-



Comd. C. 28. Percural

\$10,000. The treasure had sunk very deep down in four or five hundred years. Finally, the concern went into liquidation.

Bolivia, too, has its hoard of Jesuit gold, \$44,000,000 worth of it, hidden at Sacambaya. Much good money has been spent in looking for it. It is not generally known that a native of Bolivia did, in 1912, without any flourish of trumpets, actually unearth a hoard of Jesuit gold, valued at \$4,500,000 and derived from

gold mines in the district.

One thousand four hundred miles out from Bahia, in mid-Atlantic, is the strange and lonely island of Trinidad, a mass of volcanic rock, surrounded by boiling surf which makes it difficult for boats trying to land. Expeditions are constantly being fitted out to sail to this island on which pirates have buried an immense treasure of gold and silver, plundered from Peruvian churches, in the days of Bolivar, the liberator.

An old sea captain, on a voyage in the East Indies, was handed a chart of the island by a Finnish sailor, who pointed out a spot, called the sugar-loaf mountain, at the base of which the loot was buried. The Finn said he was the sole survivor of a band of pirates, the other members having been hanged by the Spanish in Cuba. Some time after, an English barrister, E. F. Knight, organized an expedition and set sail for Trinidad, calling on the way out at another lonely island in the

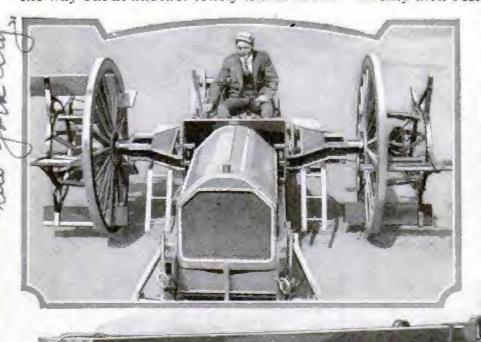
Salvages group (Great Pitou), south of Madeira. On this latter island, the British admiralty records vouch for the burial of \$2,000,000 by a mutinous crew who had murdered the captain of a ship, bound from Brazil to Cadiz, in 1804.

The English barrister and his comrades worked four days on the shining sands of the beach of Great Pitou, but the old chart had been made unreliable by the action of wind and waves on the landmarks. The shores of Great Pitou sank down on the horizon, and the ship sailed on over the Atlantic to Trinidad. Once on its terrible coast they landed mechanical appliances and stores with the utmost exertion. Near a ravine they found a cairn which the pirate's chart depicted as a landmark. They blew up thousands of tons of rock with dynamite and excavated mountains of earth to a depth of twenty feet in the ravine. Battling against tremendous odds they had at last to give up.

SCOW AND TRACTOR COMBINED TO TRAVEL SEA OR DESERT

Capable of traveling over rough ground, sand and marshes as well as water, a combination boat and tractor built to carry supplies and men to a mine in the interior of Mexico, has broad steel paddles on its wheels. These propel the scow, which is seventy feet long and has a capacity of twenty men besides several tons of freight,

and also afford traction in case the outfit, being driven on land, should sink into soft sand or mud. The motor and chassis, removed from the boat body, are capable of doing dredging. excavating or hauling. A speed of five or six miles an hour on land or water is developed, and included in the equipment is a powerful winch for use when the outfit is working as an excavator.



Harry Wise Shore the Charles Managered the Huge Wheels with Baddles Assessed to Sanker for Warre

Upper View Shows the Chassis, Motor and the Huge Wheels with Paddles Attached to Spokes for Water Travel; Below Is the Long Metal Body



Natives Thronging to View the Great Tapestry of Buddha, Spread Out on the Hillside Once a Year by Tibetan Monks as a Religious Ceremony

LIFE OF BUDDHA TOLD IN SILK ON HUGE TAPESTRY

Besides a huge portrait, a piece of silk tapestry measuring 30,000 square feet, kept at a Tibetan monastery, depicts incidents in the life of Buddha on its intricately embroidered edges. Once a year, on a bright day, the monks spread the cloth on a hillside in the belief that the display will please Buddha and give him an opportunity to see his devout followers who come from hundreds of miles around to view the tapestry.

CITIES TO USE SEWAGE GAS FOR LIGHT AND HEAT

From a by-product in the treatment of city sewage, gas from which heat and light may be derived, can be salvaged instead of wasted as is now the practice, according to a report by the Illinois state water survey. Experiments already conducted indicate that, in a city of 50,000 persons, approximately 90,000 cubic feet of this gas are given off daily from treatment tanks. It is said to contain about seventy per cent methane, which is one of the chief combustible ingredients of natural gas and has a heating value greater than that of common fuel gas, while giving off no more odor than the ordinary commercial product. The gas is formed during the process of converting the sewage into liquids in special tanks. Carbon droxide and nitrogen are other gases formed. Experiments are now under way looking toward the collection and utilization of the gas and to developing a new type of tank which will yield a maximum salvage of this by-product.

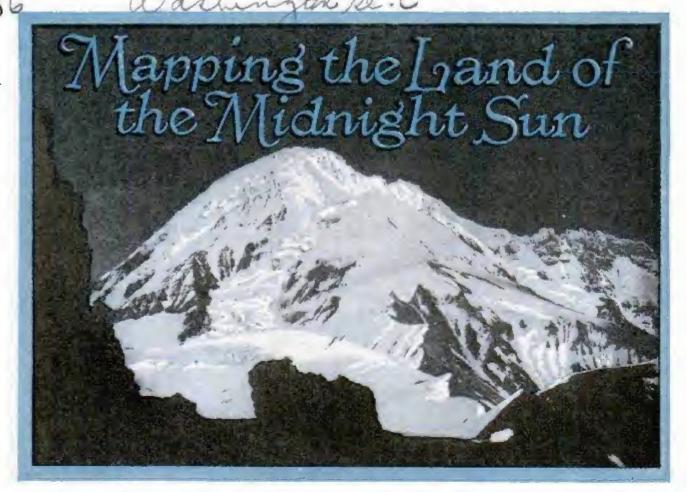
AUGER FOR BORING STUMPS 5 HELPS CLEAR LAND

Cut-over land is often cleared by dynamiting the stumps, and to simplify this work, a long hand auger to bore holes for placing the charges has been devised. It is said to operate successfully in all kinds of wood, bores an opening one and onehalf inches in diameter, and is six feet The auger has also been used to bore holes for blasting quantities of hardened acid phosphate in warehouses.



Boring Hole in Stump with Auger for Charge

428 POPULAR MECHANICS



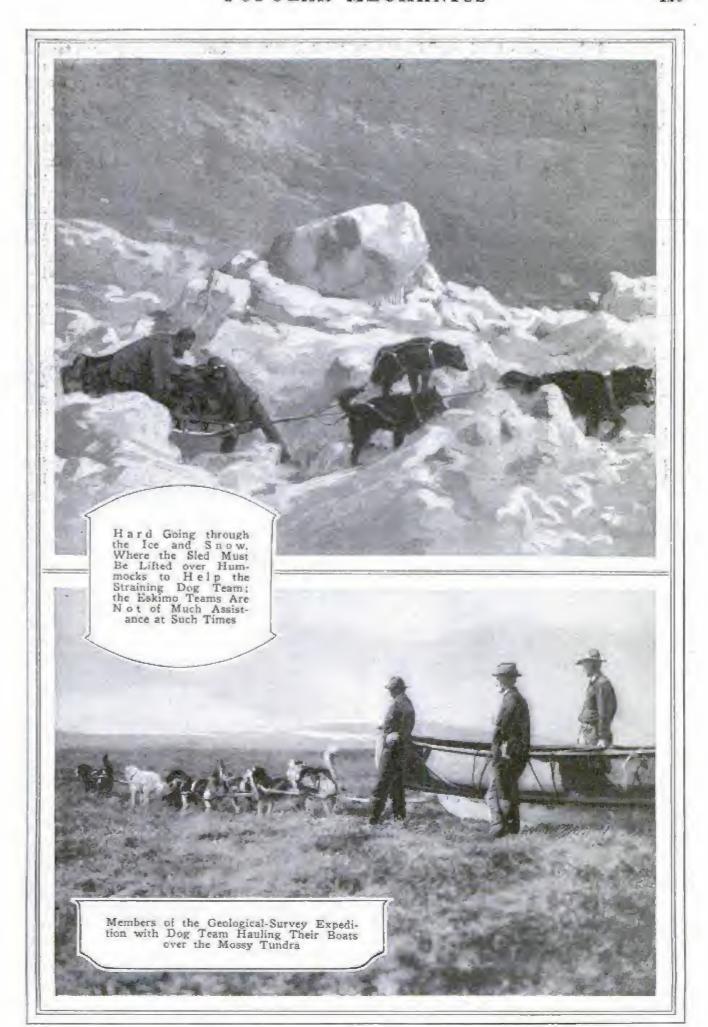
THE exploration and mapping of some 7,000 square miles of territory in extreme northern Alaska, the greater part of which had never been seen by a white man, resulted from the expedition sent out last year by the geological survey. Gerald FitzGerald and Walter R. Smith, the topographer and geologist of the party, have returned after more than seven months of work, during five of which they did not see any human beings except the other two members of their party, and were entirely out of communication with the rest of the world. The other members were Faye Delezene and Walter R. Blankenship.

The story of their trip, as reported to the secretary of the interior, is a simple narration of the doing of the job, which was part of their routine duty, but through this simple account runs an enthralling undercurrent of the adventure and romance that are inseparable from exploration in unknown regions, where success depends upon the physical fitness and capable performance of each member in meeting pioneer conditions.

FitzGerald, Smith and Delezene sailed from Seattle and arrived at Nenana, the terminus of the Alaska railroad, last spring. The fourth member of the party, Blankenship, had arrived in Nenana from Tanana with two dog teams of eleven dogs in each, the day before. Sixty miles out on the trail, Blankenship had lost a finger while unfastening the dogs from a snubbing post, but he came on to Nenana and had the wound dressed by a physician. This was the only accident of the entire trip. After two days' delay, the party set out with the two dog sleds, each loaded with about 400 pounds of camp equipment and instruments, for the head of Colville river, more than 1,000 miles away.

The route followed led down Tanana and Yukon rivers to Kaltag, overland to Unalakleet, an Eskimo village on Bering sea, northward along the coast, across Norton sound and the base of Seward peninsula, and beyond the Arctic circle to The distance of about 700 miles from Nenana was accomplished in twenty-six days of actual traveling, so that the average was twenty-seven miles a day. The greatest distance made in one day was forty-two miles. Over nearly the entire distance from Nenana to Kotzebue, at least one man ran behind each sled to guide it by means of handlebars. Often it was necessary to go on snowshoes ahead of the dogs where the trail was obscured by drifts and newly fallen snow. snow was four or five feet deep, and when the sleds missed the beaten trail a few

POPULAR MECHANICS



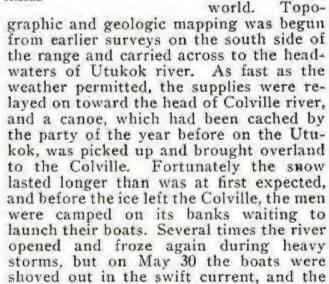
inches, they would upset in the soft drifts. Little accidents of this kind would sometimes result in a fight among the dogs. The arrival at Kotzebue ended the first stage of the journey, the greater part of it on the trail over which the diphtheria antitoxin had been raced to Nome a few months earlier, and over which the mail

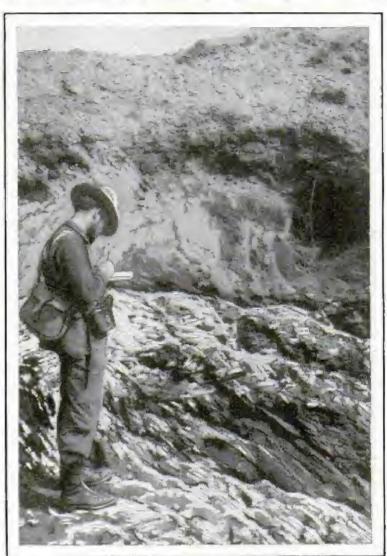
for Nome and places farther north is hauled at regular intervals throughout the winter, regardless of storms and temperature as low as sixty - five debelow grees When zero. the survey party left Nenana, the weather was warm and it had been raining, a condition which suggested an early spring and which was rather discouraging for the long trip ahead over the snow. However, the temperature dropped in a few days, and before the party left the Yukon it was thirty degrees below. One

member suffered a few frostbites. A heavy snowstorm was encountered while the party was crossing Norton sound on April 1. The snow became incrusted over the eyes of the dogs, and it was necessary for a man to go on ahead of the team. At times it was impossible to see the lead dog. Had it not been for a well-staked trail, the party probably would not have reached the roadhouse at Koyuk that night. When they arrived, however, at eight o'clock, the Eskimo keeper asked in astonishment, "Where you come from?" When informed that they had come from Bonanza, thirty miles across the sound, he replied, "I didn't think anyone would travel through that storm today.'

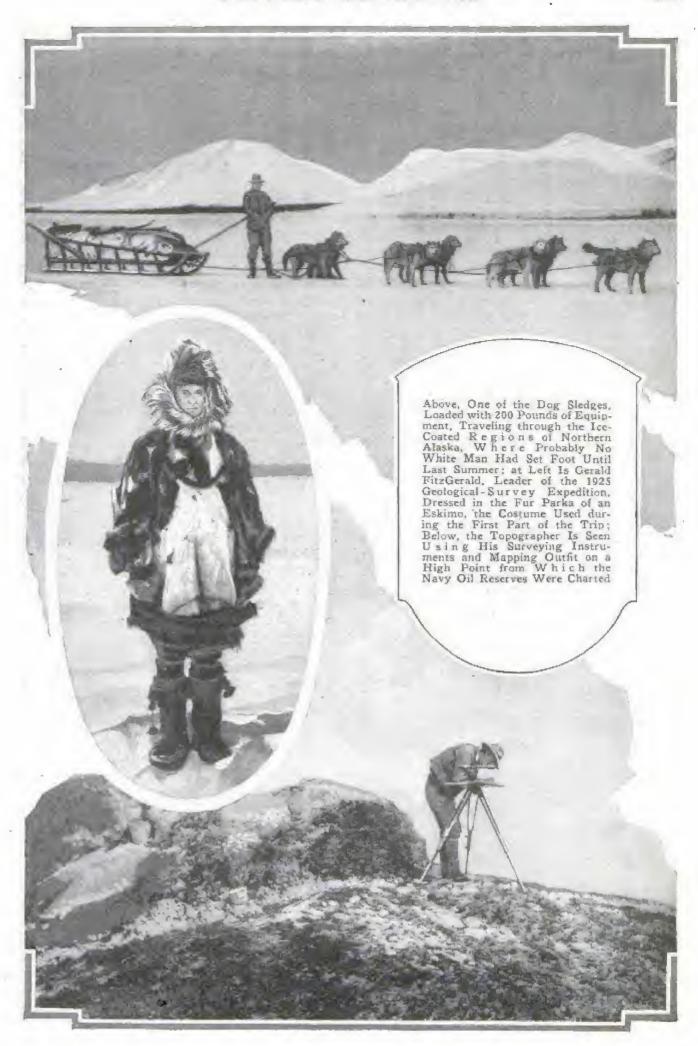
At Kotzebue the party procured supplies for the summer and hired more teams to freight the provisions and canoes up Noatak river and across the De Long mountains of the Brooks range to the Arctic slope. Kotzebue marked the last roadhouse on the trip, and thereafter the party camped in tents, except one night

> at the native village of Noa-This viltak. lage is probably unique in that it contains neither a white man nor a halfbreed and not one of the population of 250 uses tobacco. The Eskimo drivers would not go farther than the head of Utukok river, on the Arctic slope, for fear that the snow would thaw before they could return. As the drivers turned back, the little party of four white men was left alone in the snow-clad Arctic wastes, to be for months out of communication, even by radio, with the rest of the





Geologist Examining a Specimen of a Mineral Deposit Found in Northern Alaska



POPULAR MECHANICS

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actual exploration of the upper Colville

was begun.

Over white rapids and angry whirlpools and beneath undercut snowbanks, the little group floated on, never knowing what would happen around the next bend, but realizing that, if a boat should upset, it and its burden could not be regained or replaced, and that if anyone was injured, there would be no hospital or physician. Sometimes the boats would strike a rocky bar and would have to be lifted across. The dogs followed along the bank, but in trying to keep within sight of the boats, they would swim across the river many times each day.

The party followed the river for more than 100 miles and mapped an area twenty to thirty miles wide on each side. In making the trips over the rough tundra away from the river, the dogs were used as pack animals, carrying packs of twenty-five or thirty pounds for distances of eighteen to twenty-eight miles a day. Over a short portage some of the dogs

carried forty pounds.

During one of the side trips toward the north from the Colville, the headwaters of Meade river were discovered. Snowstorms were frequent, but the snow did not remain on the tundra, and by the middle of June, the hills were dotted with flowers of many species and colors. Caribou were seen in small bands every day, and enough were killed to supply the camp with fresh meat in abundance.

The country along the upper Colville is not thickly populated with small animals and birds. Formerly the Eskimos lived along its banks, and their oldigloos, pieces of clay pottery and broken bone implements were found. The people probably migrated to the coast many years ago to be nearer to the traders and missionaries. Parts of the interior northland are now unknown to the Eskimos.

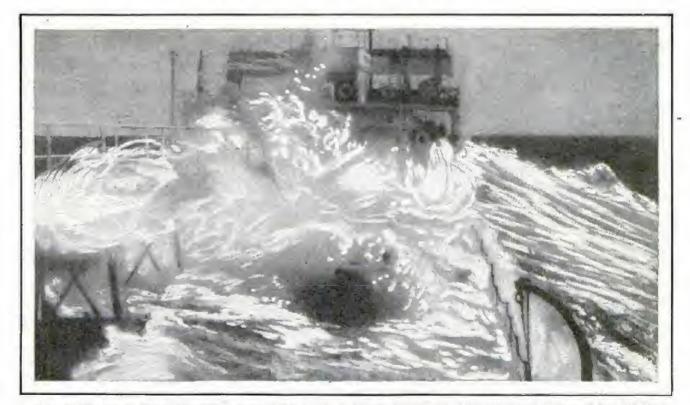
On July 13, the work was tied in to a previous survey of the central part of the Colville valley, and the party turned south up Etivluk river, a large tributary of the Colville. This river was ascended about eighty miles to its source, at the summit of a low pass in the heart of the Brooks range. The Etivluk is a swift, turbulent river, flowing over many rapids and bars. The dogs again proved very useful in lining the boats, but many times a day, for fifteen days, the entire party waded in swift ice water above their waists in order to get the boats across the rapids. maximum airline distance of ten miles a day was made in this upstream travel.

A low, broad pass was found at the head of the Etivluk, and a portage of less than one mile put the explorers on Aniuk river, one of the main tributaries of the Noatak. The party descended the Aniuk about fifty miles and closed the new surveys by tying in to the earlier survey of the Noatak.

The return trip was made down the Noatak to Kotzebue, thence to Nome and Seattle, where the party arrived in the fall.



A Bit of Hard Going along an Unnamed River, Carrying Heavy Packs on Tumplines; during the Brief Summer Sleds Are Useless, and Away from the Streams, Supplies Must Be Carried in This Way



Almost Submerged by a Gigantic Wave; Photograph of Deck of Steamer "Trimountain" Snapped by a Sailor Whose Camera Caught the Angry Billow at the Height of Its Attack

1015

BIG SHIP BECOMES "SUBMARINE" DURING HEAVY STORM

During a severe storm on the Atlantic, an alert seaman obtained the photograph shown here, a view of the S.S. "Trimountain," from New York, almost completely submerged by a heavy wave. It struck the steamer full on the side and, for a few seconds, nearly the entire deck was flooded. Although the big ocean greyhounds of today can plow through stormy weather with comparatively little difficulty, an occasional sea will give them considerable trouble.

INSECTS USE GAS AND ACIDS IN WAR AGAINST ENEMIES

Use of poisonous gases and acids in the World War was an innovation in military science, but such tactics long have been used by various insect tribes. The "bombardier beetle," for instance, when pursued by an enemy or otherwise disturbed, discharges a sort of bomb in the form of an ill-smelling reddish acid fluid which changes into a bluish smoke or vapor when it comes in contact with the air. When a log under which these active creatures have made their home is lifted, they often may be seen scurrying away and covering their retreat with a barrage of tiny gas bombs. Their red heads and bodies and blue wing covers, like uniforms, harmonize with their military ac-

tions. Several species of beetles have similar weapons for defense. The acid secretion from some leaves a persistent red stain and has a bitter taste.

STORM COVER FOR SCREEN DOOR PREVENTS DRAFT AND RUST 994

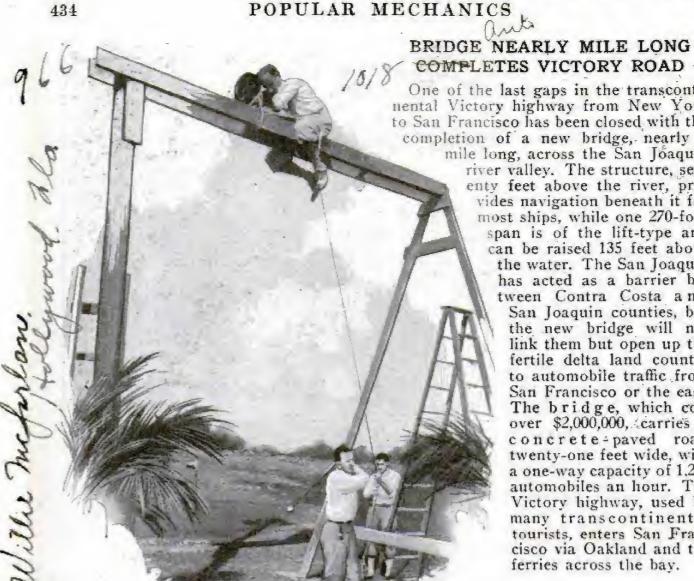
Attached to the screen door with snap fasteners, a storm cover with a window at the top, protects the mesh from rust besides keeping rain and wind from entering the house. It can be adjusted or taken off in a few moments, is easily stored away and is said to last for years.



Cover in Place, Showing the Window; and Attaching

Joseph 7.

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One of the last gaps in the transcontinental Victory highway from New York to San Francisco has been closed with the

completion of a new bridge, nearly a mile long, across the San Joaquin river valley. The structure, seventy feet above the river, provides navigation beneath it for most ships, while one 270-foot span is of the lift-type and

> can be raised 135 feet above the water. The San Joaquin has acted as a barrier between Contra Costa and

San Joaquin counties, but the new bridge will not link them but open up the fertile delta land country to automobile traffic from San Francisco or the east. The bridge, which cost over \$2,000,000, carries a concrete - paved road, twenty-one feet wide, with a one-way capacity of 1,200 automobiles an hour. The Victory highway, used by many transcontinental tourists, enters San Francisco via Oakland and the ferries across the bay.

SLOW MOVIES FROM SCAFFOLD 6 SHOW GOLFER'S STYLE

Golf Champion, Dem-

Strokes

onstrating a Few Strokes for the "Aerial"

Cameraman

Golfers have been photographed from nearly every position in playing pose, from under glass, from close and distant range, but recently aerial movies have been taken, showing how a champion player makes a stroke as seen from a vantage point several feet above his head. The camera was an "ultra-rapid" instrument, producing the so-called slow-motion film for closer study of the subject, and was mounted on The operator stratdled the a scaffold. crossbar and was further steadied by a rope about the waist and attached to the beam. The lens was directed at such an angle that the pictures would show clearly how far the player stood from the ball, how high the club was raised and the arc it described during the stroke.

The snail's speed limit is about a half mile a week.

SMALL HAND MAGNET LIFTS FIFTY POUNDS

Supplied with current from the house-lighting socket, a magnet that will lift thirty to fifty pounds, is intended to save time and labor in handling metals. It is energized by closing the circuit with thumb pressure on a push button on the Releasing the pressure, causes the magnet to drop its load. When only alternating current is available, a motor generator set is provided with the magnet

to supply direct current, or battery equipment is furnished in case electric power cannot be obtained. The magnet is designed especially for use in foundries, in



hardware plants and stores, and in machine shops for cleaning turnings or chips from places not easily accessible, although it is equally serviceable wherever it is necessary to separate magnetic from non-magnetic material.

Third



Training the Sense of Touch to Serve in Place of Ears; Deaf Children Interpreting Piano-String Vibrations as to Pitch, Rhythm and Volume through the Finger Tips

Teaching Deaf Children to Talk

How Radio and Scientists Are Helping the Handicapped to Hear and Speak by Modern Methods

By PAUL PADDOCK

THE piano was going at a sprightly tempo.

"Jingle bells, jingle bells, jingle all the

way."

Six young voices, rhythmically reciting the words instead of singing them, gave listeners a thrill, for the pupils were deaf and they were receiving the swing of the jolly sleighing song through vibrations that passed from the piano strings into their sensitive finger tips, placed lightly

on top of the instrument.

The scene is the recreati

The scene is the recreation room of the Central Institute for the Deaf at St. Louis, Mo., where medical science and the teacher of the deaf have joined hands in making useful happy citizens out of children who cannot hear. The school is a philanthropic enterprise, founded and directed by Dr. Max A. Goldstein, an internationally known ear specialist, who has devoted more than thirty years to study and practice with a view to helping those handicapped by deafness to break down the barriers of their shut-in world and to take their places in the ranks of normal

speaking and hearing persons. Because of its policy of uniting and correlating the efforts of specially trained teachers and doctors, the school has come to be recognized as one of the leading institutions of its kind. By modern methods, young children are taught to interpret sounds through their finger tips, and they learn to speak so clearly that anyone can understand them, further proving that deafness and dumbness no longer are inseparable. Since speech is only a reproduction of sounds heard, deaf persons were inevitably mute until modern science found a way to establish contact for them by means of vibrations.

The visitor sees about a hundred boys and girls, gathered from twenty different states. They range from three or four up to seventeen years in age and are living and studying happily under the direction of a specially trained corps of teachers in a well-equipped building that contains dormitory quarters as well as classrooms and laboratories. Besides the school for the young, there is a depart-

8/8 & Kingshighway

POPULAR MECHANICS



This Pupil Failed to Pass a Simple Hearing Test; the Doctor Found That Discharging Ears Were to Blame

ment of lip reading for older deaf persons, a division for the correction of speech defects and a normal training school, which has qualified more than 400 teachers for the deaf in its regular and post-graduate courses since it was started, in 1914.

Recently, the institute has become an important laboratory for the practical testing of what promises to develop into a most helpful aid to the deaf, the radio. With this marvel of the age at its service, the institute already has made two definite advances in this work. First, application of radio principles and those of the telephone has enabled teachers and investigators to determine accurately degrees of deafness and to prepare graphic charts of a child's hearing for the guidance of instructors. Second, by a radio amplifier, remnants of hearing are stimulated so that the capacity for receiving sounds is widened in pupils not entirely deaf. Its service here promises immeasurable benefit, for only a small percentage of congenitally deaf children can be proved profoundly and totally deaf, and of all the children at present in schools for the deaf, it has been found that more than thirty per cent have some degree of hearing.

The apparatus used for this stimulation: is a large cabinet containing radio-ampli-

fying equipment. Headphones are attached so that a number of children can be tested and given treatment at once. The source of the sound delivered through the phones, is either a record played on a phonograph built as part of the cabinet, or the human voice spoken through a mouthpiece which may be plugged into the amplifier. Phone sets can be regulated separately as to volume of sound output, so that they can be made to fit the degree of hearing defect in each pupil. Some children who, at first, fail to distinguish the difference between simple vowel sounds, after periods of training, lasting from three months to a year, and practicing with the amplifier only a few minutes daily, demonstrate their ability to hear whole phrases of spoken language. Constant repetition of the same sounds is required to achieve these results, just as repetition is necessary in teaching a normal child to walk.

The use of the radio is in its infancy, and its application to the

problems of the deaf is just begun, so that scientists cannot yet tell what results may be expected, but indications are that it holds most promising possibilities. To those who believe that there is something magical about the radio, as an aid to the hearing, the institute's research workers are prompt to answer that its effects are entirely due to enormous amplification of sound, and if a person is totally deaf, radio will be useless so far as receiving sounds directly is concerned.

Leaving this question of radio for the moment, the layman witnesses what is almost as wonderful: totally deaf children translating sound vibrations through their sense of touch. Here is a little girl who can repeat a variety of vowel and other sounds, changes of pitch, words and whole sentences, simply by interpreting the vibrations of a voice as they strike upon a piece of paper tightly stretched as a vibrating diaphragm across the larger end of an ordinary megaphone. closes her eyes so that the instructor's lips will not give her a clue to the sounds, and places only the tips of the fingers of one hand on the diaphragm.

Going back to the music lesson you first saw, you learn that the pupil's performance is the result of patient training and proof of what can be accomplished by the acoustic method as developed at the Cen-



39 438

tral institute. Briefly, this method is to make use of sounds as produced by the voice, various musical instruments and radio apparatus to achieve perception and interpretation of the vibrations in the mind of the deaf child in teaching him speech. As the teacher plays, the pupil's voice responds to changes in pitch and volume as well as tempo. He keeps perfect time even when the rhythm is purposely made irregular. Only one step more, it seems, and he would be singing, were it not that difficulty in performing rapid changes of pitch offered an obstacle.

These musical and other tests afford practical evidence in support of the theory of the eminent English physicist, John Tyndall, that the sense of hearing, is, after all, merely a modification of the sense of touch," Dr. Goldstein explains. other special organs of sense are modifications of the touch sense. volve the reception and perception of special waves of motion. In case the natural organ of hearing ceases to function, a logical course is to endeavor to use some other channel for conveying the sound waves to the brain. With proper training, deaf pupils manage to do this effectively with their fingers and even with their feet. They learn to keep time while dancing to music from an orchestra by interpreting the rhythm which is communicated from the instruments, through the floor into their feet, up the bones and into the special centers of the brain."

The pupils you have just heard and seen belong to the senior classes. Two of them are ready for graduation into a regular high school, where they will be able to compete creditably with hearing children as other graduates of the school are doing. To prove it, they recite an algebra lesson. Descend to the floor below, and you will see the real beginners of the institute, the three and four-year-olds, and how, the first bridge is thrown across the gap that separates the deaf child from the rest of the world. The problem is to get the pupil, who is hardly more than a baby, to produce sounds with his vocal cords. To the layman, the task is like requiring him to draw or build something that he does not know exists and with nothing from which to copy and do it, so well that it can be identified. But the deaf child is given a guide, the teacher's voice, and again the sense of touch helps where the ears are useless.

Beginning with the pupil at this early age is important, for it is at a time when he naturally is trying to speak just as normal children do. Then, if he is allowed to go without this teaching, in a



Teachers Wondered Why These Pupils Had Trouble with Their Lessons. The Reason Was That They Had Poor Hearing; They Failed to Hear Whispers at Twenty-Five Feet



few years the vocal cords become shriveled_up_just as muscles that are not used

for long periods.

The pupil places his hands on the teacher's cheek bones. The instructor then makes the sound of "m," drawing it The child's out slowly and distinctly. hands, which have felt the vibrations of the tone, are placed on its own face so that he can feel the vibrations produced by his voice in trying to imitate the sound the teacher made. The time required for successfully taking this first step varies widely in different pupils, as mental efficiency is an important factor in their progress, just as it is with normal children. It may be days before the pupil even realizes what he is supposed to do. A great deal depends upon the skill of the teacher. Her special training is aimed to help her understand the deaf child's psychology; she is required to know much about physiology and the anatomy of the Her task is not only to teach the child lip reading and speech, but she is his guide through the whole school course; he is dependent upon her for all that he acquires from his whole range of studies.

Once the contact is made, it is only a question of time and constant teaching until the child acquires a vocabulary,

learns to read lips without depending upon his sense of touch and advances into simple problems in arithmetic and other studies.

In all the courses, the

aim is to make the acquiring of hearing a cheerful and spontaneous task. The pupils develop eagerness and brightness, losing the dull, detached expression that usually identifies the sign-taught. Due to their training in lip reading and the application of the touch sense, they sometimes become even keener and more alert than a normal child, and their ability to con-

centrate easily-for there are no extraneous sounds to disturb them-aids them in their progress.

Recognizing that the deaf, if given proper instruction early enough, can be-

come useful members of society, other organizations throughout the country are putting forth renewed efforts in reclaiming deaf children by modern methods of teaching. There are now more than 200 schools for the deaf in the United States alone, and many public schools and colleges have special departments for teaching deaf children. As a result of the introduction of the principles of radio amplification, instruments are now being constructed by which large groups of children in the normal schoolroom may have their hearing capacity measured and classified with comparatively little expenditure of time and energy. This plan is now being seriously considered and introduced in public-school systems of many of our metropolitan cities. Chicago, Detroit, New York and Kansas City already have begun this work of classification, and the determination of even slight degrees of defective hearing in the mass of publicQ school children. It is estimated that there are between 50,000 and 75,000 deaf children of school age in the United States! While their condition is deplorable, in the eyes of modern science, it is far from hopeless, for, assuming normal brain capacity, every one of them can be taught speech and lip reading so that they cantake their places in the world.

SWING WITH HANDLEBAR SEATS DEVELOPS CHILD'S MUSCLES

> Besides affording healthful sport, a child's lawn swing. now on the market, is in-

and arm muscles, as feet and a pair of handlebars. The seat is suspender which are adjustswing himself with little effort and yet gain sufficient ex-, ercise to benefit

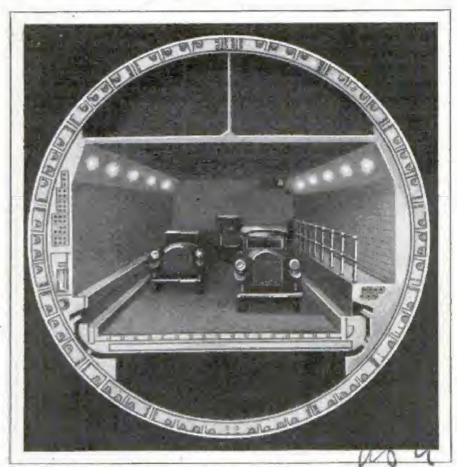
tended to develop leg it is propelled by pushing against supports for the from three cords, able for height to fit children of dif-€ ferent ages, and is so arranged that Enjoying a Ride in the Push-Seat Swing

him. The apparatus is easily set up, and occupies but little storage space.

Traffic delays in New York City, it is estimated, cost \$500,000 daily.

FRESH AIR FED TO AUTO TUNNEL BY EIGHTY-FOUR MOTORS

What engineers declare is one of the greatest triumphs in ventilation equipment and planning is represented in the automobile tunnel under the Hudson river in New York. The subway consists of two tubes. The main problem was how to insure sufficient circulation to get rid of noxious gases from the autos, and to supply fresh air for motorists and engines too. Some authorities believed that the task could not be accomplished. There were few data applicable to just such a situation, so tests were devised specially to meet the particular problems involved. The plan, as finally adopted, included the installation of eighty-four electric motors with a combined horsepower of 6,260 to turn fans for ventilating the tunnel, which was constructed so that the air would rise from vents near the roadway and pass through flues located in the ceiling. An exhaust-air duct runs the full length of each tube and occupies the upper portion. of the passage. Ventilation is introduced at two points, instead of blowing the air into one and drawing it out at the other. Two-thirds of the motors will be kept running constantly, the remainder being reserved for emergency use.



Cross-Section Sketch of Hudson River Tunnel for Vehicles, Showing Fresh-Air Vents at Sides and Upper Duct for Poison Fumes



Sight in Middle of Bow Helps Archers in Aiming at Target on Long Shots

SIGHT SET ON MIDDLE OF BOW IMPROVES ARCHER'S AIM

Fitted to the middle of the bow, a short sight, somewhat similar to that used on rifles, is said to enable the archer to direct the arrows more accurately. It does not interfere with the use of the bow and is said to be especially helpful on long-dis-

tance "shots," as it aids in gauging the correct elevation to counteract the downward course of the arrow.

MOVIE COBWEBS MADE OF GLUE / 003 AND GLYCERIN

From a mixture of glue, glycerin and powdered chalk, realistic imitations of cobwebs are prepared for motion-picture sets. The substance is placed between two boards which are suddenly drawn apart. Long strands of the composition are formed, which, when draped across old furniture or on walls or ceilings, satisfactorily pass for the real article. Buckets of paraffin wax, which has been melted, will quickly form into "icicles" when allowed to drip from the sets.

Rans City Jime

442 New MECHANICS agracion



GUARDS KEEP CARS ON TRACK AT BRIDGES AND FLOATS

To prevent derailments at bridges, turntables, car floats, transfer pits and other places in the track where the rails may not be in exact alinement, an eastern inventor has devised a set of wooden guards which are locked to the rails and act as supports to keep the car wheels from slipping off. They are specially adapted to car ferries, it is claimed, in transferring cars to and from the solid tracks, as changes in level and the unsteadiness of the float add to the danger of derailing. The new guards have undergone exhaustive tests for several months in Brooklyn, N. Y., yards, and, according to reports have been found to work satisfactorily.

ALCOHOL IS MADE FROM COAL

While the process has not yet been developed to the point of commercial practicability, a system has been devised for producing alcohol from coal and steam. A model of the type of plant required for this was exhibited at a meeting of

the American Association for the advancement of science. The process is said to be somewhat similar to that employed in using the nitrogen of the air for the production of ammonia and fertilizer which can now be done without the need of large amounts of water power to supply electricity.

One of the secrets of the method is the catalyst or substance used to cause the combination of the constituent elements of the product it is desired to make. Heat and pressures ranging from 1,500 to 15,000 pounds to the square inch are employed in the process.

FOOTBALL GAME WITH FINGERS

One of the latest amusements in London is a mimic football game played on a table with the first and second fingers, which are inserted in miniature boots. Two, four or six persons can play at one time, goals are represented at the sides, and the rules are based on those which govern the soccer game.

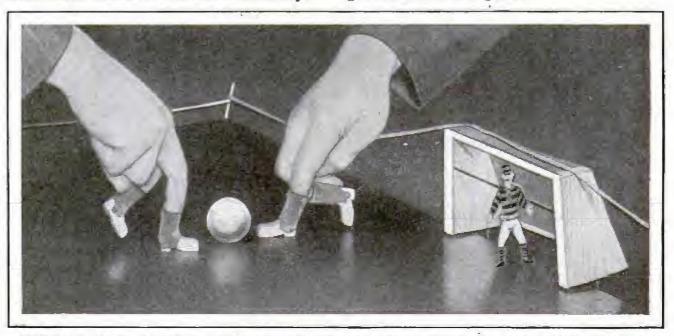
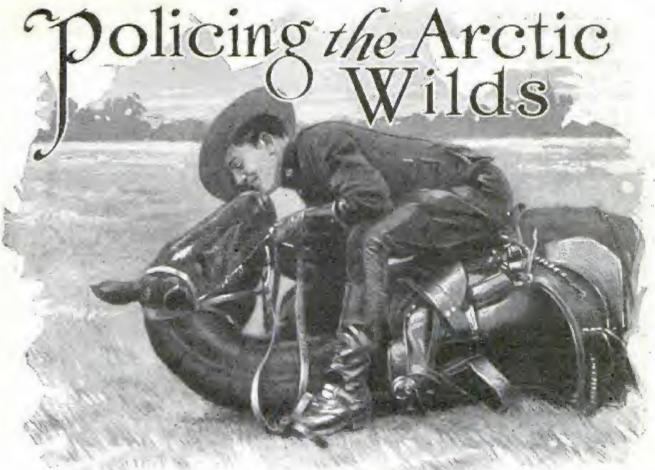


Table Football Players in Action; Little Boots Are Slipped on Fingers for Punting, and the Object, as in the Real Game, Is to Drive the Sphere within the Goals

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Horses Are Regarded as Being as Important as the Men in the Northwest Mounted Police and Are Put through a Training School That Turns Them Out Schooled Well Enough for the Stage

By FRANCIS DICKIE,

RADIO audiences throughout the eastern section of the United States last winter heard several broadcasting stations halt their programs for three or four nights in a row to send out a message addressed to two men spending the winter far up above the Arctic circle. The message notified them that food was needed at another camp more than 100 miles away, because a supply boat had failed to reach it before the waters north of Hudson bay froze over.

The men at both camps were members of the world's most famous police force, the Royal Canadian mounted police, formerly the Royal Northwest mounted police. With barely a hundred officers and men in the Far North, they police a section embracing nearly one-third of all Canada, and do it so effectively that the fictionist who coined the slogan that "the 'Mounties' always get their man" did not exaggerate so far as might be expected.

They don't always get the man, but when failure comes, it is never through failure to try. Some of the celebrated cases in the annals of the fifty-two-yearold organization were not closed until one constable after another had tracked a suspect for several years, if necessary.

The use of radio to deliver instructions to one post about sending food to another marks the advent of a new weapon in the policing of the wild. A number of the more distant posts were equipped with receiving apparatus last year, and sending sets will follow later. The wireless waves are expected to bridge the vast distances from Hudson bay to the heights of the Yukon and from Slave Lake to the Arctic sea at Coronation gulf, and simplify the work of guarding the Indians, Eskimos, hunters, traders, trappers, missionaries, and the wild life, moose, caribou and valuable fur bearers of the region. At present, months often elapse before the grapevine telegraph of the north, carrying messages on snowshoes or dog sled, gets word to the nearest post that a mounted man is needed at some distant camp.

Frequently a year or two pass before the principals and witnesses in a case can be rounded up and brought out to civilization, or a judge and court transported in to them. Last summer a judge of the Alberta courts, with prosecutor, defense counsel, court stenographer and all the appendages of a white man's law court, went north by rail to Waterways, the end of steel, and then took steamer down the Mackenzie to Aklavik, in the river delta country, where an Eskimo was waiting trial for a murder committed at Coronation gulf. With a jury of trappers and steamboat men, they held court on the open deck of the ship and pronounced sentence.

On the same steamer, between twenty and thirty new recruits went north to spend two years in the mounted service at the far-flung posts above the Arctic circle. It takes so long to reach the ground and learn the territory that volunteers are accepted for not less than two years' service.

The red tunic and yellow-striped trousers of the mounted mark its men wherever they go, but there is little glory in wearing the uniform of the service. They work so far from civilization that the world seldom hears of their exploits, and the only record left is a constantly growing pile of reports, each stamped in turn "case concluded."

Inspector T. V. Sandys Wunsche recently handed in completed reports which set forth that he had traveled 2,540 miles to make the arrests in the case, 1,470 miles by steamer, 320 by launch, 250 on foot and 500 by canoe. He came back with a tribal

medicine man who had instigated a murder, the girl who had committed it and three of her brothers. The medicine man was sent to the penitentiary for manslaughter and the girl given a suspended The white man's law is ensentence. forced throughout the north, but tempered with leniency because, to the Indians and Eskimos, practices frowned on by civilization are considered proper. In this case no Indian in the Liard river country believed a crime had been committed when the tribal medicine man decided an eighteen-year-old-boy had bewitched an aged man who was dying, and advised the dying man's daughter to tie the boy out in the snow to drive out the witches. The boy died, and so did the sick man.

The witchcraft episode occurred at Thirty Mile Bar on the Liard river in northern British Columbia. An Indian of another tribe, following a trap line across the mountains, heard the gossip and passed it on to Frank Bass, who runs a little trading station at Liard post. Bass told a party of prospectors, and the story passed on down the river with them. Then the Indian agent in the Etikine country heard the yarn and sent it along to the chief Indian agent at Victoria, who in turn called on the mounted police to investigate.



Photos Copyright, Underwood & Underwood Horsemanship Has Been the Major Boast, Next to Straight Shooting, of the Mounted Police Since Its Earliest Days; the Forage Caps Have Been Replaced by Stetsons, But the Tunics Are Still Red



Riding Instructor of the "Mounties" and a Bunch of Recruits with "Blackie," One of the Many High School Horses, Trained to Help Its Rider in Many Ways in Time of Need

In the meantime, half a year had elapsed, the nomad Indian tribe had moved on and the trail was almost blotted out, but the inspector started out and, after several weeks of travel, reached the vicinity. There his troubles began. None of the Indian tribes cared to talk about the affair, but advised the mountie to drop

the case and go home.

The day after he arrived in the neighborhood, accompanied by two constables from another post, a native visited their cabin and proceeded to "witch" their weapons to keep them from using them. Watching until he believed no one was looking, the Indian slowly revolved on one foot before the gunrack and then touched each rifle in turn, confident that the process would keep them from shooting straight. He was doomed to disappointment, for the inspector, who had watched the performance out of the corner of his eye, arranged a shooting contest and, with the constables, easily outshot the antiquated trade guns of the natives.

Information was scarce, but the party worked down the Liard, questioning everyone they met about the natives who had camped at Thirty Mile Bar the winter before. Eventually they learned the Loot family of a Dene tribe was responsible for the killing and began to trace them. Some days later, they found a spot beside the river where wolves had been digging and unearthed the body of an Indian boy, with hands and legs still frozen together as he had died while bound in the snow.

While they were thus employed, an Indian stopped his canoe to ask who told them that Atol, the Moccasin, was buried there. He was questioned and turned out to be one of the Loot brothers. his sister, who had done the actual killing, his two brothers and big Alec, the giant medicine man of the tribe, were arrested. The inspector held an impromptu grandjury investigation on the spot, and after hearing the evidence he had already gathered, committed the five for trial. The investigation disclosed that tying up a person was the accepted method of ridding him of witches, but that frequently if the affair occurred in the winter, the victim froze to death. The boy Atol lived six days bound out in the open.

In the winter months practically all travel by the mounties in the Far North is done by dog sled. Trips of 1,000 miles or more are quite common as they make their rounds. Those who returned last summer from their two years in the Hudson Bay country told of one occasion, while hunting for two Eskimos for the murder of two white men, when a team of thirteen dogs moved a boatload of provisions for four miles overland, the boat and load making a burden of 423 pounds per dog, several times the weight of the

animals.

On another occasion, a mounted officer, traveling with one Indian from Split Lake post to Fort Churchill, went snow-blind and at the same time the Indian was stricken with pneumonia. The two made camp on Governor's island, in the Church-

6 446

ill river, and after fixing the Indian comfortably, the blind man boarded the sled and gave the dogs their heads. The team took him sixty miles down the river and into Fort Churchill, where he told his story. A relief sled was started out with one man, leaving at five in the morning, and was back at nine at night, having covered 120 miles in sixteen hours. The seven dogs of this team carried the 140-pound constable on the way out and the Indian and a quantity of mail on the return trip.

The records of the force are filled with deeds of heroism and self-sacrifice, or rather, they are filled with skeleton reports which oftentimes hide such deeds. For instance, those of Pleasant Camp, B. C., under date of May 19, 1898, state:

"Constable Frederick Hillier met death by drowning at the ford of the Kicking Horse river at five o'clock p.m. yesterday while returning from border-patrol duty. Report reached here too late to go in record of 18th. Immediate application made to Sergeant-Major Barlow, Atlan division, for constable to fill place on account of miners rioting on Porcupine creek."

Behind that brief entry lies a story of unequaled heroism. Two constables were riding the Dalton trail when they started to ford the river, made dangerous by spring floods. One horse, feeling the quicksand sucking at his feet, threw his rider and escaped. The other horse drifted down to a sandbar and reached land. The lucky rider looked back and saw his companion, waist-deep in the water, being drawn down by the sand scarcely thirty feet from the bank. The only rope they possessed had been tied at the saddle of the runaway horse.

The rider on the bank tried to spur his horse back into the stream, but the animal refused. The rider sprang off and plunged into the river toward his companion, who was silently awaiting his fate. Hillier, held by the sand, shouted to his companion to go back. "You can't help me a bit and you'll only get stuck yourself," he called. His friend refused to heed the warning and pressed on. Suddenly the doomed man jerked a revolver from his belt, shook the water from it and leveled it at his companion.

"Jack, I've got less than five minutes to live," he said. "Don't send me out with the stain of murder on my soul. You come another step and that's what you'll do."

The would-be rescuer hesitated for an instant, and in that moment the current snatched Hillier away. Three or four lines in the post log and a hurry-up call for another man because the miners were rioting was his obituary.

The history of the mounties goes back to 1873, when Sir John A. Macdonald decided to organize a body of men "without gold lace." Three hundred men were recruited in Toronto and sent to Fargo. N. D., then the railhead of all the northwest. From there, pulling one small cannon, they walked 800 miles overland to the foothills of the Canadian Rockies and began establishing their posts. Outnumbered by turbulent Indians more than a hundred to one, they succeeded in bringing about order. During the Boer war a detachment of mounties won fame in South Africa as dead shots, and again in the World War the force sent 738 former members to France and 174 to the Siberian front.



Horses of the Mounted Are Taught to Lie Down and Seek Cover as Well as Their Riders, a Valuable Trait When Pursuing Desperate Men into the Wilds of the Far North



While Winter Snows May Block Roads to Other Vehicles, This Propeller-Driven Bus on Skis Makes Swift Trips over Ice and Crust between Helsingfors and Sveaborg in Finland

TAXI ON RUNNERS FOR WINTER DRIVEN BY PROPELLER

Airplane and sled are combined in a useful vehicle for travel during the winter months between Helsingfors and Sveaborg in Finland. Three broad skis, two behind and one in front, have been adapted for runners and the bus, which will hold several persons, is driven by a powerful airplane propeller. Steering is done with the single ski.

MAKING SINGLE NEEDLE TAKES WORK OF SEVENTY MEN

Needles are insignificant things, but to finish a single one from a plain piece of steel to the article ready for use, the work of as many as seventy men is required, and the implement must pass through twenty-two processes before it is ready for the market. Most of the labor is in finishing and polishing them. In primitive times, thorns, pointed sticks and sharp bones were used for needles. One of the important steps in the development of the · human race was the discovery of the timesaving possibilities and added efficiency gained by putting the eye in the needle.

FOLDING CHAIR FOR OUTDOORS HAS LOOPS FOR ARMS 98

For cyclists, campers or hikers, a fold ing easy-chair that fits in small space when rolled up and is quickly adapted for use has two loops or slings to hold the arms, so that the occupant can be comfortable while reading. The seat may be placed against a tree or other support, protects the user from dampness and may be adjusted to various angles for reclining.



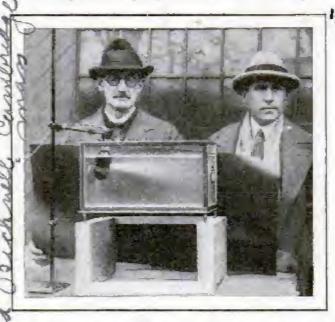
Cyclist Enjoying a Roadside Rest in Folding Chair; the Loop Straps Comtortably Support the Arms While Holding Paper

Lelans, 16 arenne

POPULAR MECHANICS

ARC LAMP WITH "LIQUID LENS" TO IMPROVE MOVIES

Increasing the intensity of the light for motion-picture projectors and stereopti-



Lamp Surrounded by Its Liquid Lens, a Solution of Substances Which Increase Light's Intensity

cons, a liquid between the lamp itself and the lens, also absorbs the heat. It is a mixture of water and various other substances, and promises to be of great aid in medical application, as beneficial rays can be projected through it for hours over the body with less hazard, and the eye can also be brought close to the light source without danger.

IN ROTARY SOIL TILLER OF

Work that ordinarily can be done only by using several implements is said to be

performed by a motor-driven harrow and plow for light soil tilling. It is steered and controlled with an extension bar and has a set of twenty revolving steel tines that dig into the ground, loosen and pulverize it while helping the outfit along. One man can easily manage the implement, and it is specially suited to work in orchards, as it can be guided between

trees, close to the trunks and without damage to branches, such as is likely to occur when larger equipment is used.

CYCLIST BREAKS SPEED RECORD BEHIND MOTORCYCLE

Pedaling behind a motorcycle as a windbreak and directed through a special speaking tube attached to the driver's back, a bicycle rider in France recently shattered records by attaining a speed of seventy-four miles an hour. The motorcycle was constructed to meet the demands of the test, having a broad shield at the back to keep the wind from the racer and a streamline front of special design. So that the driver's words would be carried more distinctly through the speaking apparatus, a mask screen of transparent material was fitted over his face and around the mouthpiece. Both the driver and bicycle rider wore helmets. The demonstration was staged on the Mont Chery race track, near Paris.

IN ARIZONA RELICS? Q 1

Did the Jews establish a kingdom in Arizona long before Columbus discovered America? Evidence which seems to support the theory that they did, has been found in a number of relics dug out of limestone, five feet below the surface, near Tucson. While some scientists are in doubt as to the genuineness of the objects, others declare that, whatever their origin, they must have lain under the earth for centuries. The relics show both Jewish and Christian influences and some bear dates of 760 to 900 A.D. The inscriptions have been interpreted as describing

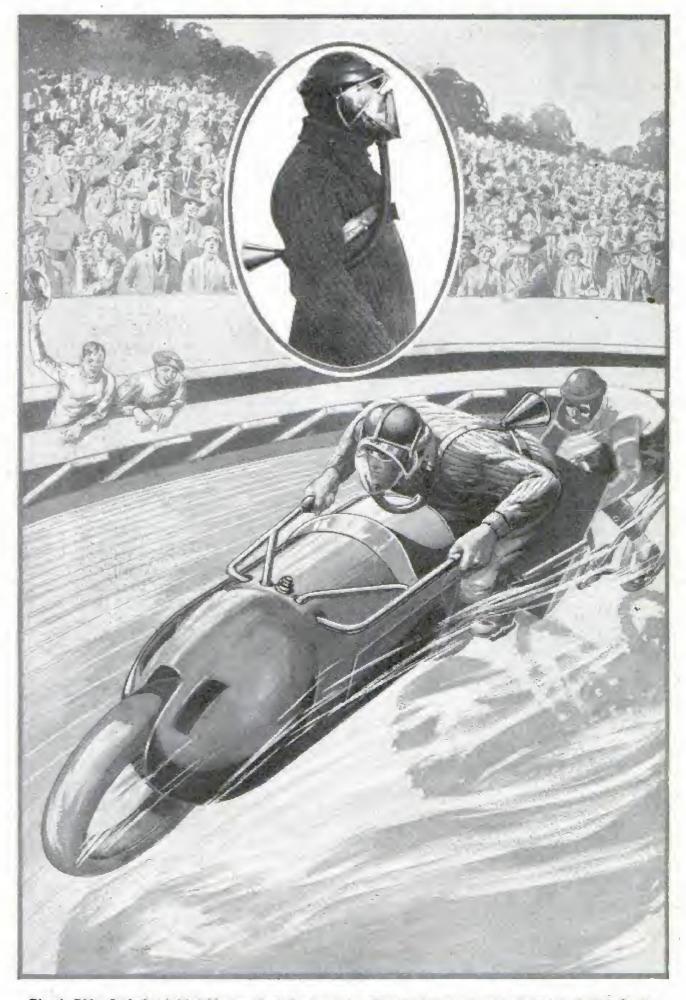
the conflicts of the prehistoric Roman-Jewish kingdom in the southwest with the Toltec Indians, forerunners of the Aztecs. If the objects prove to be genuine, scholars believe that they will help clear up what has been a puzzle to many research students, the evidence of European or other outside influences in the rites and ceremonials of some of the Undian tribes.



Convright, Special Press

Tiller in Operation; Revolving Blades Help Propel the Apparatus and Loosen the Soil

Tucago Irline



Bicycle Rider Sprinting behind Motorcycle at Seventy-Four Miles an Hour and Being Directed through Speaking Tube; Inset, Driver Wearing Mask with Horn Strapped on Back

No acata

POPULAR MECHANICS

METER IN HEAD OF GOLF CLUB RECORDS FORCE OF STROKE

How far can you drive a golf ball? A meter-equipped club now on the market



Meter in Head of Golf Club Registers in Yards the Force of a Stroke against the Ball

is intended to eliminate much of the guesswork in such estimates, as it automatically translates into terms of yards the force of the blow when the club strikes the ball. The indicator is set in the head and has a button on the other side by which the mechanism is released for another registering after the reading has been taken.

JUNGLE WOOD SERVES AS ICE.

But half as heavy as cork, balsa wood which grows in the tropics, particularly in Costa Rica and Ecuador, has been found excellent for insulation both from heat and cold. A small box of it, packed with fish at one degree above freezing, is said to have kept the contents at almost the same temperature without the use of ice on a journey halfway across the continent. The material is being used for shipping ice cream and chocolates and a New York architect is experimenting with it as lining for a house to keep out cold air and retain heat.

The wood is also being used for the manufacture of toys, airplane propellers, stage scenery and for museum mountings and specimens. In a New York theatrical production, an imitation stone wall erected for a long run, weighed over two tons. The same set was reproduced in balsa wood for the road and weighed less than ten pounds. It has proved of special use in life preservers and rafts. The natives in the countries in which it grows discovered its value for boats and floats many years ago, the name "balsa" being the Spanish for raft. It is said to have about half the strength of spruce. An advantage claimed for the material in airplane propellers is that it permits the use of motors of slower speed. The government is now experimenting with balsa propellers, which are four times the size of one of ordinary wood, yet much lighter.

HORSEPOWER AT WILSON DAM READ ON MANY GAUGES

Whenever engineers wish to determine how much horsepower is available from the water flowing over Wilson dam in Alabama, a dozen or more men are required to read the gauges which are placed across the channel. Each man takes his place at a given spot on a floating weir and reads the gauge which shows the volume of water in cubic feet passing through that place per second. With the height from which the water falls known and with the total volume passing through all the open gates computed, the horsepower is readily determined.



Reading the Gauges at Wilson Dam to Measure Horsegower

450

How Gartoons
are Syndicated

Million Dollars' Worth of Space Devoted by Newspapers Each Year to Comic Strip Showing Gasoline-Alley Adventures

IN a hundred Sunday-morning newspapers from coast to coast each week appears a full page, in four colors, showing the adventures of a group of just average everyday people whose garages abut on one common alley. In as many, or more, papers the same characters appear each weekday in a "strip" seven or eight columns wide. In a year's time the papers devote more than a million dollars' worth of space (at their current advertising rates) to this one cartoon alone.

The reason lies in the new idea in newspaper comics—human-interest stories with a continuity, as the film people say, instead of the antics of impossible boys sawing holes in the floor for their elders to drop through, or performing similar

stunts.

Frank King, creator of "Gasoline Alley," which appears in American newspapers reaching more than 5,000,000 people each day, was one of the leaders in creating the new style in cartoons. From a \$22.50-a-week artist on the Chicago Tribune staff, drawing fancy borders to fit around the pictures of beautiful divorcees and other news celebrities, he has become one of the highest-paid newspaper cartoonists, helping to keep a vast organization busy distributing his work and the work of his fellow comic-strip artists.

The story of the distribution, or syndicating, of the features which appear simultaneously in papers throughout the country is a story of big business organization. No one paper, even the largest of metropolitan dailies, could afford to employ an entire staff of feature writers and artists at the salaries they command, but by syndicating their output among scores or hundreds of papers, the smallest city can see each day the same features that appear in New York or Chicago, and pay only its proportionate share of the large expense.

Newspaper syndicates are owned by a number of the large-city papers, and others work independently, employing their own artists and writers. The cartoonists are usually ex-newspaper artists who got their start, as Frank King did, retouching photographs and drawing borders in some newspaper art room. comes a chance to do a cartoon on some timely subject, or the artist in his spare moments gets an idea for a whimsical drawing. From that, if his ideas hold out, he develops a strip; his paper tries it out for a while, and if it takes hold with the public, it goes into the syndicate, and a fat contract follows. Sidney Smith, creator of the Gump-family cartoon a few years ago signed a million-dollar contract, and his newspaper celebrated the event by



presenting him with the most expensive imported limousine on the market.

Both the Gumps and Gasoline Alley appeared in the Chicago Tribune for some time before they were sold to other papers. Both have the same basic idea, the daily adventures of ordinary Americans, each strip featuring various grown-ups and at least one youngster. The artist who cre-

ates a newspaper comic must not only be an expert cartoonist but a man with plenty of ideas. He plans his work weeks in advance, creates new situations, and then follows them along for days, and sometimes even for

months. In a presidential-election year Andy Gump ran for chief executive on an independent ticket and burlesqued the issues of the day. The comics follow the seasons and their holidays, and, despite the fact that they must be planned days in advance, often mirror the news of the world.

It is customary to have two separate stories running through the cartoons, one in the daily strips and another for the full pages on Sunday, which appear in colors in the comic sections. The reason is that the papers which use the daily strip do not all have Sunday editions using comics, and some of those using the full page on Sunday do not use the daily strip. In addition, the artist, from time to time, must prepare extra strips and pages introducing the characters and giving a synopsis of their lives, to be used by new mem-

board, and put in

final form with pen



Frank King and His Fellow Artists Inspecting the Day's Work, and, Above, Some of His Drawings of Walt, Skeezix and Rachel, the Maid





The title may come first, or follow completion of the strip.

From the artist the strip or page goes to the engraving department, is photographed on a copper plate, engraved and prepared for the mechanical department.

The next step is to transfer the engraving to a paper mold in which type metal is poured to produce the printing plate. A machine carrying rolls of blotting paper and other rolls of a special tissue paper automatically cuts off sheets somewhat larger than a newspaper page, pastes them together - four sheets of the blotting

rollers which press out the excess paste and bind the parts firmly together, and finally delivers the completed sheet to the drier. There are two processes of stamping the impression in the mat. In one the dampened matrix is placed over the engraved plate, rolled in until it fills every indentation, then covered with moistened blankets and placed in a steamheated press to dry the impression in place. A faster process uses a drier mat and heavier rolling pressure, shortening the steaming process from several minutes to a matter almost of seconds.

The cartoonist delivers a full week's supply of strips at one time, and all are reproduced on one matrix, which is them clipped apart for convenience in mailing.

At the newspaper plant the process is reversed. The mat is placed in a casting. box, surrounded by containing walls just type-high, and molten type metal poured

in. The casting boxes are water-cooled, and the hot metal chills so quickly that the tissue surface of the mat is hardly browned.

The casting, after being sawed to the proper size, is placed in the page form and made up along with the newspaper type. The page form then goes to the stereotyping machine, and a mat is made of it in the same way the original comic-strip matrix was produced. The page mat is bent into a half circle and placed in a large casting box, and the entire page cast in this form, ready for the circular roll of the high-speed presses which print the daily papers.

Being a friend or neighbor of one of



Cartoonists Keep Regular Office Hours, Cudgel Their Brains for Ideas, and Admire the Finished Job

som, a comely

addition to the ranks of those whose garages abut on the alley. Few who have followed his adventures, however, know that Walt in private life is Walter Drew, a long suffering brother-in-law of the artist. It was on a Sunday visit to Drew several years ago that King got the idea for the cartoon strip, which, incidentally, started out not as a strip, but as a rectangle, a three-column-deep cartoon for the sporting pages. Drew had an alley garage back of his home, and King accompanied him there to watch him tinker with his car. Several neighbors were do456

ing likewise, and out of their alley friendship grew the idea. Bill, another of the Gasoline Alley characters is taken from real life, being a locomotive engineer.

orphan girl, thought she might be losing her popularity because her creator had had her adopted in a rich household. So, for an experiment, the strip was omitted one morning. The result was a flood of telephone calls, personal visits and letters, all demanding to know what had happened to Orphan Annie. The newspaper restored the cartoon next day, explained the omission, and invited suggestions of the open calls, personal visits and letters, all demanding to know what had happened to Orphan Annie. The newspaper restored the cartoon next day, explained the omission, and invited suggestions.

The doctor, known as "Doc," is a composite, according to King, of several characters.

The artists are flooded with ideas and suggestions from readers, most of them impractical for one reason or another, but Mrs. Blossom, the widow, grew out of The writer explained one such letter. that she was a widow and had few friends until she bought a small coupe and rented an alley garage. Then the neighboring garage occupants offered their advice and assistance and frequently took her riding in their larger cars. King introduced a widow to the alley, with the same results. Skeezix, a foundling left on the doorstep of the bachelor Walt, on St. Valentine's day, 1921, and since adopted and raised by him, is modeled after the artist's own son, who happens to be five years older than the cartoon youngster. King, however, explains that he went back in his memory and has reproduced many of the experiences and sayings of his own boy, attributing them to the comic-strip child.

from readers as to Annie's future adventures. Hundreds of letters resulted, opinion being well divided as to whether she should remain the ward of a rich family, return to a previous home with a poor farmer or some other station in life.

Public taste and desires frequently

shape the future for the comic-strip char-

acters. Recently one paper, which features a cartoon built around a little

HACKSAW WITH STEEL FRAME CUTS CORRUGATED IRON

170

Ordinary hacksaw blades can be used for cutting corrugated iron and other metals with a patented

with a patented frame introduced in England. It is constructed of steel and is triangular in shape, affording an easy stroke, and is fitted with a special cast-steel blade particularly adapted to cutting asbestos and similar material in either flat or corrugated form.

Briston Road, a In

l. a. Vance

12 POPULAR MECHANICS

BUFFALO IN CANADIAN HERDS

Canada's efforts to preserve the buffalo from extinction have been so successful

that the herds have become a problem. Space in the national park at Wainwright, Alta., is exhausted. About 8,000 animals are kept there. and it is estimated that there will be nearly 2,000 more by the end of this spring. Many will have to be slaughtered or part of the herd taken to the Wood buffalo park near Fort Smith, in the northwest territories. In recent years, about 2,000 buffalo have been killed and commercial disposition made of the meat, and of the skins for robes, which were sold for \$50 to \$75 apiece. The present herds are the result of the government's care of an original herd of 700 once owned by a Montana man, The first steps in the preservation

program were taken in 1907. The experiment has proved so successful that there are now about 12,000 buffalo in Canada.

LIGHTHOUSE ON WRECKED SHIP PROTECTS NAVIGATION

When salvaging operations were temporarily suspended on the monitor "Glatton," purposely scuttled in Dover harbor. Eng., during the war, the ship was fitted with a small lighthouse so that the wreck would not be a menace to navigation. The beacon was firmly attached to the highest part of the hull and, though small, provided sufficient illumination to warn boats of the danger. The monitor was sunk when it caught fire with 600 tons of ammunition on board.

IS RUN BY TRACTOR Q 60

Capable of handling logs as large as thirty-four inches in diameter, a portable



Running a Sawmill with Power from a Tractor; the Outfit Can Be Hauled Directly to the Timber

sawmill, run by power from the farm tractor, can easily be taken to the timber and quickly rigged up or taken down. The carriage is built in standard lengths of fourteen and twenty feet. With the former size, a forty-five-foot trackway and a forty-six-inch saw are suitable. A balance wheel, weighing 300 pounds, is also part of the regular equipment. The outfit is designed to reduce the cost of converting timber into lumber where only small quantities are needed and where the woods are inaccessible to larger units. To

save fuel, the tractor may be rigged so that the sawyer will be able to control its speed, allowing it to idle when the saw is not cutting, and thus keeping the engine comparatively cool.



Wrecked Ship Becomes Foundation for a Lighthouse; Beacon on the Monitor "Glatton," Scuttled during the War, Warns Other Vessels While Salvaging Was Temporarily Halted



English Subscribers Listening to an Illustrated Talk on Telephoning: Screens in the Background Depict the Interior of the Exchange Stations; Successive Steps Are Pointed Out by Lecturer

HOW PHONE CALLS ARE MADE SHOWN BY EXHIBIT,

Just what happens in a telephone exchange when a subscriber asks for a number has been graphically illustrated by a working model prepared in England. The apparatus consists of replicas of switchboards with operators on duty, and screens depicting the interior of the exchanges. Two persons seated at tables, one on each side of the display and using telephone instruments, represent actual parties to a telephone call. A lecturer explains the various steps involved from beginning to end of the call.

SKILL OF DIAMOND CUTTERS INCREASES GEMS' VALUE

If a young Hollander, Ludwig Van Berquen, had not discovered, some 450 years ago, that diamonds can be cut and polished with dust formed by rubbing them together, it is possible that the gems today would be no more highly regarded than they were centuries before Christ, just as bright glasslike crystals, extremely hard, but with no special play of color or brilliance. When Van Berquen went to Paris, the jewelry trade was highly developed and after several years of experimenting, he found that by imbedding the diamonds in cement and grinding them together, he obtained a fine powder with which he could cut and polish them. The art was rapidly adopted by gem workers. and the diamond's value mounted tremendously. Cuttings are now made in

much the same way as they have been for hundreds of years. The stones are first carefully examined to determine their structure and the most suitable way of cutting them to avoid waste. A groove is marked, the cutter places a steel instrument in the depression and strikes a sharp blow with a hammer. Great skill is required, for a single misdirected stroke may ruin a valuable stone. One of the most exciting incidents in the history of gems occurred when the great Cullinan diamond, which weighed a pound and three-quarters in the rough, was cut. The wedge was broken at the first blow, but at the second the great crystal, which looked like a lump of rough glass before it was polished, fell into two parts and -from these were prepared the two huge diamonds now among the British crown jewels, and several smaller gems.

HOLDER FOR CIGAR-BOX COVER IS EASILY ATTACHED

Covers of cigar boxes are held open at the desired angle for displaying the goods



by an easily attached patented clamp that fits on the edge of the box. The lid rests between the curved sides of a prop extension at the back. The holder does not

break the cigars and fits securely,

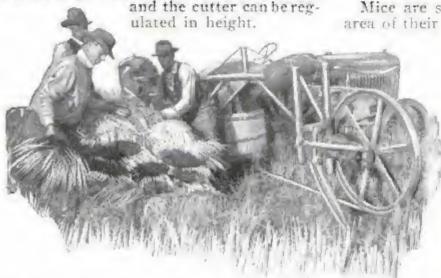
1023 Bush Ill.

WOODEN COVER FOR BUILDING, MOTOR-DRIVEN ROLLER SKATES PERMITS WINTER WORK 9 % 6

Temperatures of fifty degrees below zero failed to halt work on a hotel at Lake line-burning motors, roller skates devised Louise, B. C., which was rebuilt after being partly destroyed by fire. An immense wooden sheet was constructed, five feet from the steel frame. It was lined with tar paper, and steam pipes connected with temporary boilers furnished heat for the workmen. The "overcoat" was 300 feet long, fifty-two feet wide and ten stories high, and cost a large sum, but the expense was considered justified since it enabled the workers to finish the hotel for the summer season. Concrete, brick and plaster work were all done behind the shelter, as temperatures almost as high as those of the mid-year months were maintained without difficulty.

SAW FOR CUTTING GRAIN SHOCKS SAVES FARMERS LOSS

Intended primarily for use in rice harvesting, but equally applicable to gathering wheat, oats and other grains in shocks, a patented cutter devised by a Texas farmer promises to save much of the loss that often results from rain on crops in the field. It consists chiefly of an ordinary tractor which pulls a band saw, one and one-half inches wide, operated by a separate motor. This saw cuts the top off the shock, freeing the grain-bearing part from the water-soaked base, thus permitting quick drying and hauling direct to the thresher. Only two men are required to operate the outfit, one to handle the tractor and the other to manipulate the cutter. The sawing can be done with little or no disturbance of the butts of the bundles,



Rice Shock Tipped Back to Show Clean Cut Made by Motor-Driven Saw; Tops So Severed Dry Quickly

RUN ON ROUGH GROUND

Propelled by small acetylene or gaso



by a German engineer are said to develop considerable power and will run not only on pavements but on rough surfaces as well. Controls are operated through connections reached with the hands. The engine is built on principles discovered in making small motors for airplanes.

On Motor Roller Skates over Rough

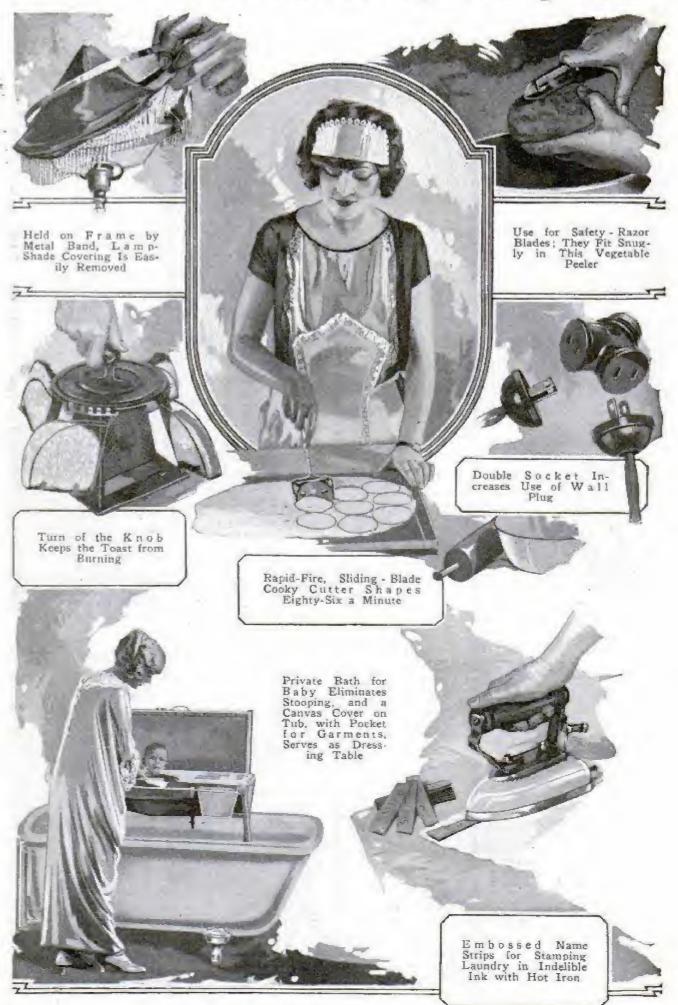
Ground

LIGHT WEIGHT OF HOUSE MICE PROTECTS THEM IN FALLS.

Mice are so light in proportion to the area of their bodies, that if they fell from

a height of 1,500 feet, they, would suffer only a slight bump, scientists declare. A falling mouse would be borne up after the manner of a parachute, air resistance and the comparatively large surface exposed checking the rate of descent. Rats and larger rodents are not so protected, while a horse or man falling from such an elevation, of course, descends at such speed, despite the greater air resistance, that the fall of necessity must end fatally.

Time and Money-Saving Tools



for Woman's Workshop in Home



462 6 3 8. Copperular Mechanics 14/18/23

PLAYTHING OF PAST ADAPTED TO PRODUCE DESIGNS

An adaptation of the old-fashioned kaleidoscope, which formed ever-changing



Simple Figure Reproduced Eight Times in Geometrical Design by New Device; Inset Is What the Eye Sees

geometrical designs of colored glass when revolved in the hands, has been invented by a Chicago art instructor to assist artists and designers in producing new forms of patterns. Two black-coated glass reflectors are mounted above a revolving tray in such way that the angle between them may be varied from ninety degrees down to a narrow slit. At the top of the mounting is a peephole for the eye. Looking through it at an object placed on the tray, the eye sees a series of reflections which produce geometrically perfect duplications of the object or design. Varying the reflector angle changes the number of images seen from two, four, five, six, eight, to as high as ten and twelve. An infinite variety of designs may be seen by revolving the tray or changing the angle of the reflectors. A scrap of paper with a few curved lines appears as a complicated design Even the scrap itself may Jewelers' designs for complibe used. cated pieces are created by wadding a piece of paper and placing it between the reflectors, while a tiny fragment of silvered paper becomes a shimmering setting.

(At no place in the British Isles, is the sea more than eighty miles distant.

DIFFERENCE IN SILK AND WOOL SHOWN BY SIMPLE TESTS

As a guide for women who wish to avoid adulterations in buying wool and silk articles, the following tests are published in a bulletin prepared by the state college of North Dakota: "Hold the wool material to the light. It should be firmly woven, otherwise it will not keep its shape. Ravel out warp and woof threads and break them. Wool pulls apart with kinky ends, while cotton breaks. Wool burns slowly, giving off an odor of burning feathers, and leaves a large amount of ashes. Cotton makes a flame while burning, has the odor of burning leaves and gives a fine gray ash. If cotton is present in the wool, it will burn with a flame. This is one of the most simple and satisfactory tests for detecting cotton in wool material. The ends of cotton threads spread out when burning. Brush the surface of napped cloth briskly. If the nap loosens and drops off, the cloth will soon wear threadbare and look shabby. Pure silk is light in weight and has long endurance. When silk dresses and blouses crack or give at the seams, soon after they are made up, the silk is weighted. Before purchasing silk, burn a sample of it. True silk burns slowly, giving off an odor of burning feathers. The ash coils up into a tiny ball on the edge of the burning material. Weighted silk burns slowly, holding its shape after being burned.'

FASTENER FOR TAPE MEASURE

With the aid of a fastener attached to the end ring of the tape measure, one person can use the rule with little difficulty even on long meas-



Fastener Holds End of Tape So That One Person Can Use Measure Easily

that can be inserted in wood or other material or fits over the edge of the surface. When not in use, it is turned down to lie flat/against, the ring.

Ceuffel & esser Third &

to fall before they gnaw it down; they cannot drive stakes or suck the air out of logs; do not use their tails as shovels or trowels, and they do not cut up large logs. An evidence of their apparent stupidity

is in gnawing, perhaps the better part of

a whole night, on a thick limb, then, on

returning the next, cutting a new notch so far to the side, that the first is practi-

webbed hind feet only, using the tail as a rudder. The front feet are used in apply-

ing mud to their lodges-mounds of

sticks, moss and soil inside of which they

live. A shelf a few inches above the water

trance to the lodge is deep enough be-

low the surface so that it will not be

frozen solid in the winter. The beav-

er's principal problem is to store sufficient wood to afford bark and juicy

food during the months when it is

imprisoned. In doing this, an elaborate system of dams and canals as

well as roads leading to the depths

of the forests, is constructed.

Where the current of the

stream is slight, the

dam will be almost

straight, but where

the flow is rapid,

it will be curved

to conform to

the current.

and succes-

sive series of

dams will be

built to raise

the water.

is constructed on which to sleep.

cally useless.

They swim with their

Holder May Be Placed Directly on Battery or on Wall HOLDER FOR BATTERY TESTER PREVENTS ACID DAMAGE 844.

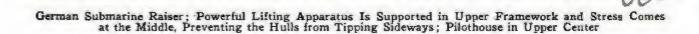
Battery Tester in Rack, Where

Drippings Are Caught in Cup;

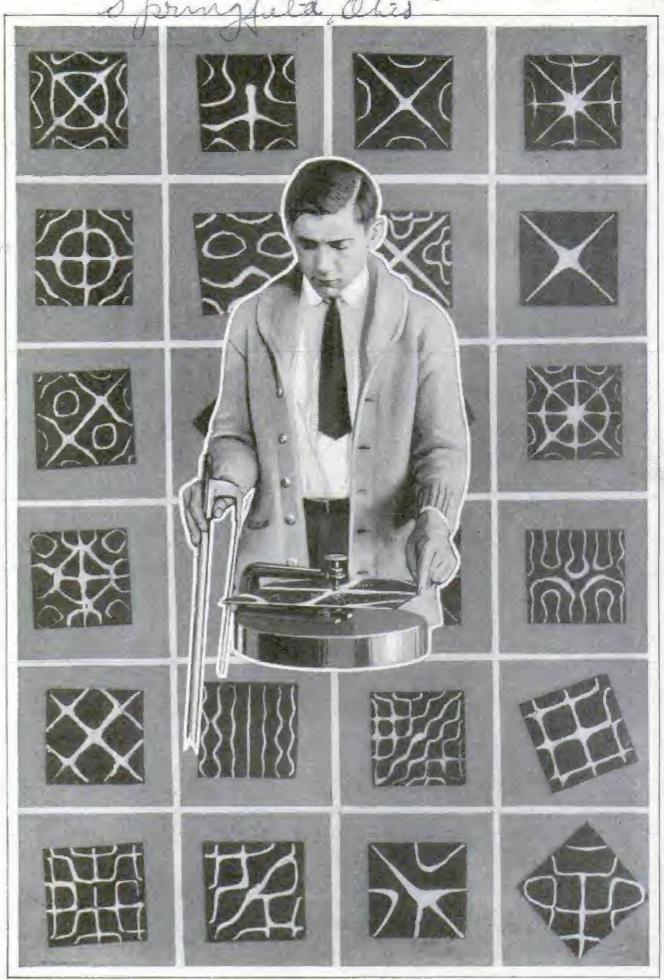
What to do with the storage-battery hydrometer after using it, has been solved by a small holder that can be attached to the battery itself, keeping the instrument in safety and preventing dripping of acid on carpets or floor. The end of the glass tube rests in a small container and the handle is secured by a catch.

LIFT SUBMARINES

For raising sunken submarines,
German engineers have devised
powerful tackle suspended from a
strong steel superstructure
which links two hulls.
Pull is exerted at the
center so that neither
of the boats tips.
The twin vessels
straddle the submerged sub
which is raised
between them
and thus taken
to dock.



464 Of Patt 7 POPULAR MECHANIES College



Sand Patterns, Produced by Vibrations, and, in the Center, How They Are Made; Metal Plate, Sprinkled with Sand, Is Held in Clamp, and Violin Bow Drawn against One Edge, While Finger Touches the Other

new (156)

SOUNDS ARE PICTURED IN SAND TO SHOW VIBRATIONS QL 2

With a violin bow, a clamp, a square brass plate and a small quantity of fine

sand, interesting "sound pictures" can be produced to show the effect of different vibrations. The sand is sprinkled on the plate, which is held in a horizontal position by the clamp. While holding the finger on an edge of the metal, the bow is drawn across another edge. The sand immediately leaves the parts of the plate that are in vibration and collects in geometrical patterns which can be changed simply by readjusting the clamp, moving the finger and the bow to a different place. The action of the sand illustrates what takes place when a stringed instrument is played, that is, the string is made to vibrate in equal parts instead of as a whole when the finger is placed at any point on it. Because the plate vibrates in different areas at the same time, the sand is shaken into the peculiar forms that appear. Plates of other material than brass may produce different

sand patterns. The shape and size also affect the form of the figures.

WINDOWS LOCKED BY WEDGE TO FOIL BURGLARS

Inserted between the sash and frame, a sharp-pointed wedge locks the window

when it is closed and also serves to keep it open at any height for ventilation. Travelers who wish to obtain added safety at hotels or other places may slip this in their bag. The wedge is thin enough to suit most windows.



SURFBOARD HAS TWO RUDDERS TO PREVENT SKIDDING

To eliminate lateral skidding, one of the chief dangers in the sport of surfboard



Roman Riding on the Waves; Double Surfboard Has Rudders and Is Intended to Prevent Lateral Skidding

riding, an eastern inventor has devised an aquaplane in the form of rudderlike strips, one for each leg. Their relative position may be shifted as needed by the rider, whose feet rest on pads that are connected by a rod with the end of the rudders.

SHIPS RETIRED FROM SEAS FIND ODD JOBS

Their days of usefulness for regular sea duty over, many old windjammers enter new careers, escaping the hands of the ship breakers. In Biscayne Bay, Fla., an old vessel has been fitted up as a restaurant; another in Valparaiso, Chile, is being used as a laundry and another as a storehouse for a steamship company. A number of the smaller hulls are converted into lighters for coast service. Some ships are fitted up as training vessels.

Photographs of Movie Stars Pasted on Switchboard Opposite Connections to Their Private Phones for Operator's Reference

PHOTOS REPLACE NUMBERS ON PHONE SWITCHBOARD

Photographs of motion-picture stars opposite the connection of their private telephones on a switchboard in a California studio, save the operator the trouble of remembering numbers. They are uniform in size and in case of changes in dressing rooms, the pictures can be shifted accordingly, saving the trouble of copying names or other means of identification.

TO INCREASE FOOD SUPPLY

With population rapidly growing and land reserves diminishing, scientists are turning their attention to the possibilities of submarine farming as a means of replenishing the food supply. That the oceans hold fortunes in sunken treasure and in fish, everyone knows, but deep-sea pastures are not commonly regarded as gardens in spite of the fact that many plants already are being used for food. In the Northern Pacific, there are nearly 2,000,000 square miles of sea bottom which have never been explored. What grows several miles beneath the surface is little known, but waters to a depth of several hundred feet are crowded with many varieties of plants, ranging from those scarcely

visible to the unaided eye to the kelps, some of which have stems 100 feet long and tufts thirty feet across. So plentiful are these growths that the sea is sometimes compared to a thin vegetable soup. In Japan, 100,000,000 pounds of kelp are consumed an nually. The product is dried and shredded, and appears on the market in about fifty varieties, including sheets, sticks, sugared sweets, powder as "curry" for rice, and even as a kind of tea. ·Forty-five factories in Osaka are devoted to converting the kelp into. edible substances which have been used in Japan since 1730. From agar agar, a kind of seaweed, gelatin is obtained, and in Japan, it is used for window panes as well as a thickening for soups.

Appetizing dishes are prepared by the Scottish highlanders and Irish peasants from dulse, a seaweed, and a variety of ocean moss, collected in large quantities at low tide, is made into an easily digested kind of flour.

GLARE SHIELD WORN ON HAT PROTECTS AUTO DRIVER

For protecting the eyes when driving by day or night, a shield adjusted to the hat

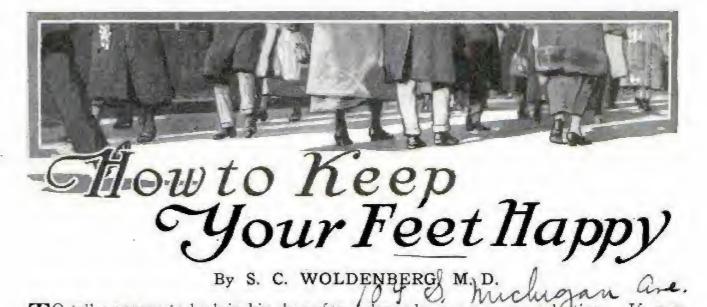
brim is made in two sections, either or both of which may be tilted back to give a full view a head if desired. After dark, for instance, the right side of the shield may be tipped back while the other blocks glare from



approaching headlights and, at the same time, permits a clear view of the right-hand side of the road. With both flaps lowered by day, the driver can face the sun without squinting or injury to his eyes.

¶Instruments for recording weather conditions have been sent to a height of four and one-half miles by kites.

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To tell a person to look in his shoes for health, happiness and success may sound like a riddle, but it isn't. It is a simple truth, the importance of which is growing as we discover that many human ills may be traced directly to foot troubles and that foot trouble generally is due to ill-fitting shoes. Your efficiency at your work, the way you feel when the day's toil is done, your disposition may very likely depend upon how you are treating two of the most faithful, but often the most cruelly abused servants of your

body.

The vice president of a large railroad company, liked for his cheery nature, recently became so cranky during working hours that even his best friends dreaded to enter his office. He was aware of his temper, thought that ill health was partly to blame, but did not know what was the matter with him until a friend convinced him that his real trouble lay in a minor foot ailment. A dull ache, all day long, kept him in ill humor. You know how you feel when your tooth aches. Throbbing, painful feet have much the same effect on the disposition.

When you buy your next pair of shoes, give a thought to your foot. Remember that it is a marvelous propelling machine

as well as a support for the body. Nature intended that it should be unfettered, but civilization has produced customs and cement sidewalks; hence, we must incase our feet in shoes. They may be a source of comfort or a menace to your health. Much

and firm, preferably. Avoid high heels if possible. However, for some persons, high heels may be indicated. In most cases, the body is held erect most easily when a person stands correctly so that a line drawn from the base of the skull to the heel will be perpendicular to the earth's surface. This is what is known as the average normal line of weight bearing. The weight is distributed to the heel and ball of the foot in a tripod arrangement to help maintain the balance as well as support the body weight. Now, if the heels are too high, they tip the body forward. This must be offset by an effort on the part of the person. Strain on muscles that were not meant to be strained results. Just what this may

amount to was computed by army tests.

depends upon your selection. If you would have a shoe that will not injure

your feet, let it be one with a straight

last, like that of the army shoe. It should

be straight from the tip to the ball of the great toe and the distance from the ball

of the great toe to the heel, should corre-

spond, in the shoe, to that in the foot. The

toe of the shoe should be rounded, not pointed, and the shank—the portion un-

der the arch of the foot-should be stiff

It was shown that a soldier, five feet seven inches tall and weighing 154 pounds, when wearing a heel three-fourths of an inch thicker than the sole, had to exert strength enough to be constantly lifting fifty-six pounds from the ground to keep his



Typical Flat-Foot Condition, the Result of a Broken Arch Generally Due to Ill-Fitting Shoes

balance. In case he was loaded with sixty pounds of pack and equipment, the balancing strength required was 116 pounds.

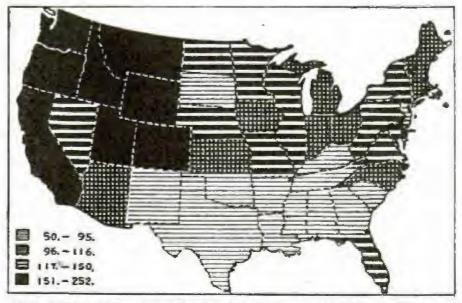
The common effect of too high heels or too short shoes is to crowd the toes downward and inward and to contract the powerful heel cord that helps lift the weight of the body. This disturbance of the normal position of the body may produce such serious results as spinal curvature, backache, pains and deformities of the feet. Shoes for an adult person should be at least one-half inch longer than the distance from the heel to the tip of the great toe. Do not wear thin soles. Thick, firm leather—not the stiff, unyielding kind, like that of the heavy, hobnailed shoes-is better, for it helps in the support of the foot and decreases jarring. If they are of the proper shape, it makes little difference, other than seasonal, whether the shoes are low or high, although, with the low shoe, there is less interference with the tendons.

Of course, you want attractive shoes, but if you are tempted to select too small a size, just for the sake of fashion, and the clerk assures you that they will be all right after you have worn them awhile, remember that the popular idea that every pair of new shoes must be "broken in" is Your shoes should be just as wrong. comfortable the first day you wear them as they are after a month or more. What really happens in the majority of cases of so-called breaking-in, is that the foot is being broken down. Either consciously or unconsciously, you favor that part of the foot which is being chafed or pinched by ill-fitting shoes. In time, this may cause wrong posture of the body or deform the foot, resulting in a flat-foot condition. A survey of about 1,300 school children in Chicago recently, showed that, approximately twenty-six per cent of them were suffering from curvatures, and many cases were undoubtedly due to foot defects. The importance of selecting proper shoes for young, growing persons cannot be too strongly emphasized, for it is often at that time of life that foot defects are formed, resulting in serious troubles later. The soles of a young person's shoes should never be too heavy. A firm heel is preferred.

Care of the feet is as essential as the choice of proper shoes. One of the war's great benefits was repeated emphasis of this and other proofs of the relationship between foot troubles and shoes. Army examinations showed that in the south, where going barefoot is common, less than 100 men out of every 1,000 were suffering from pronated (out-turning) or flat feet. The number in other sections of the country reached as high as 252 out of every 1,000, particularly in the mountain regions of the west, where many wear heavy walking shoes, chosen with little thought of fit or comfort, but mainly for durability. Col. Munson, of the army medical corps, declares, "the effect of badly fitting shoes upon the psychology of war is very great. Even when the soldier is able to continue the march, the discomfort produced at every step soon reduces buoyancy of spirits, causing mental irritation, and materially diminishes the fighting capacity."

The same is even more true of the army of workers in peace times. You see them every day, trudging half-heartedly to and from their tasks, toeing in or toeing out, their heels run down at various angles,

ankles bulging and many obviously suffering from corns, bunions, poor circulation, indigestion, nervousness and even more serious ailments. member that you cannot easily conceal your foot troubles. Almost any skilled orthopedic surgeon, by a glance at your shoes, can detect your pedal ailments. Improper weight bearing, and not necessarily poor workmanship, often causes your shoes to wear out in the peculiar manner they sometimes do, breaking open at the sides or toes or wearing



Cases of Flat and Pronated (Out-Turning) Feet per 1,000 Men, as Discovered during Draft Examinations; Notice the South's Favorable Record





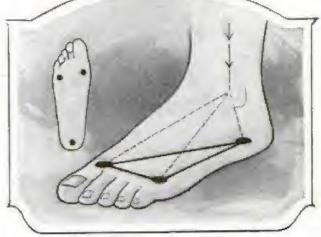
Straight Inner Side of Normal Foot: Soles of Sensible Shoes and Diagram of Body-Weight Distribution

off at various angles at the heel. Toeing out seems to be more common among women than among men. Ill-fitting shoes are almost always to blame. Women, as well as men, were intended to walk in a straight line, the feet pointing directly

in front with each step.

An excellent treatment for the feet, whether you are suffering from corns. bunions, excessive perspiration and coldness or not, is what is known as the "contrast bath." This is nothing but alternate immersions in hot and cold water. recommended method is to use a watch while taking the bath, keeping each foot first in water as hot as you can stand for a minute and then in cold for the same length of time, alternating the process. This should be done at least once, but preferably twice, a day. To make the water soft, a little washing soda should be used. Baths of this kind help stimulate the circulation which often is impeded by pressure of the shoes, prevent excessive perspiration, calluses and various forms of skin disease likely to afflict the feet. Remember that your feet were never intended to be cooped up in such tight quarters as a shoe. If you wear a close-fitting glove, you feel the stiffness and the swelling that it causes in a short time. With improper shoes, your feet suffer this mistreatment to a much greater degree, for the weight of your body aggravates the tightness of the shoe each time you step. If you are putting on weight each year and crowding your feet into narrower shoes, you are doing what an electrician does when he attempts to put a ten-horsepower load on a two-horsepower motor.

There are countless remedies for corns.



but the best of all is a correct shoe. A corn is nothing but a hardening of the skin, a callus which nature provides to resist unnatural pressure on that part of the The right kind of shoe will eliminate the cause of the undesirable chafing and the corn will disappear. Thousands of soldiers were rid of their corns during the war, just by wearing army shoes. The calluses and corns returned in many instances when they went back to the footwear of civil life. One of the best ways to treat a corn or a callus is to rub it gently with pumicestone after washing the feet. This scrapes off the excess tissue, achieving the same effect as cutting, without the danger of inflicting a serious wound. Repeated rubbing will keep the corn down, and it will naturally vanish when proper shoes are worn,

A bunion is an overgrowth of the bones of the big toe due to unnatural pressure and constant irritation of the shoes. An operation is usually necessary for its entire removal, but properly fitting shoes will relieve the suffering in many cases. If conditions are not bettered by a proper

POPULAR MECHANICS

810 470

fit in shoes, you should visit a reliable specialist and let him prescribe a remedy

which will fit your conditions.

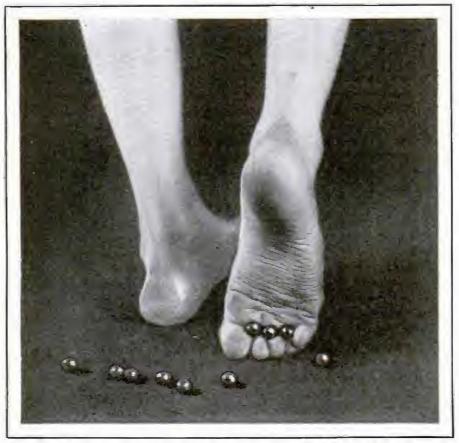
In the majority of cases, artificial arches are not needed. The selection of shoes made along anatomical lines, that is, in accordance with the structure of your feet, will relieve arch troubles and prevent their development. If not, the only safe course is to seek the advice of a trust-worthy specialist.

The bones in your feet have no keystone to support the arch as is the case in a building. They would fall of their own weight unless held in place by muscles and ligaments. Remember that there is no relation between the height of the arch and the strength of the foot. Many persons boast of high arches, believing that they indicate a superior foot. It may be that such a condition is a malformation and needs correction. An artificial arch that has been constructed along a common pattern may not be adapted to your special needs. Your foot may be compared to a carefully constructed bridge, made to conform to certain uses, grade conditions and angles. If a prop is needed, it must be adapted to that particular bridge. Putting in a bolster of any kind may throw the whole structure out of alinement and cause a disaster. Such a result is likely to follow a haphazard selection of artificial arches and improper shoes.

Even if you do considerable walking, your foot muscles may not get the proper exercise, for the reason that they are constricted within the shoe. The common practice is to do less and less walking with the increase of the automobile and other means of easy transportation. The malady called "automobile foot" is common among chauffeurs, draymen and others. It is simply a form of arch weakness. Such persons, and many others, would benefit by resorting to special exercises.

Here are three simple stunts that require but little time and produce helpful returns. Cross the legs and, while holding one knee stiff over the other, extend the supported leg. Now bring the foot upward and inward, repeating the movement until you have counted to 100 slowly. This exercises the large muscles in the front, rear and at the sides of the foot. Assume a squatting position, turn the feet on the outer side and curl the toes inward. Repeat while counting to 120. Picking up marbles with the toes is another excellent exercise. You may fail to clutch them at first, but practice will enable you to grip as many as five or six at one time. these exercises should be done while barefooted and may be performed both at night and morning. The primary object

> of these simple muscle developers and the wearing of correct shoes, is to prevent foot troubles. To cure a specific ailment may likely require the aid of a specialist, as has been noted, but with a little intelligence and care, you can save yourself suffering and the expense and trouble of treatments. Avoid pain and serious sickness by giving your feet a chance to perform their services as nature intended they should. Other things being equal, the battle in the industrial and business world today goes to the person who has good feet. You cannot be fully efficient at your work if your feet are being shackled, injured and cramped in ill-fitting shoes. If you have persistent aches and cramping of the toes and feet,



How Many Marbles Can You Pick Up with Your Toes? Practice Gives Foot and Toe Muscles Helpful Exercise



Straight Shoe Last Permits Bones of Feet to Lie Naturally Instead of Cramping Them as Shown at Right

aches in the knees or in lower part of the back, at times mistaken for kidney trouble, look after your feet and, if necessary, consult a reliable physician. If

you feel abnormally tired at night and lack the pep to take your daily exercises, you may find that the source of the trouble lies in your feet, and that a good pair of shoes may work the remedy.

It is a well-known fact, recognized by the most prominent doctors and surgeons of the country, that frequent backache is, many times, the result of flat or weak feet and incorrect posture. It is impossible for one in such a short article to show the different, definite reasons for this trouble as one would have to go into the details of the mechanism of the body. But, in brief, it can be stated that it may be the result of poor body mechanics. That is, when the feet are thrown out of their normal alinement, a stooping posture may result.

Assume that a man has defective feet or a sore spot on one or both of them. In order to avoid pain, he does not hold himself naturally. And he is put to an effort to maintain his weight in this abnormal posture. New pressure and strain are put upon the muscles of the foot and leg. This, in turn, upsets nature's plan for carrying the weight of the body upon the feet. The weight is distributed unnaturally upon them.

The shoe must give way to respond to the pressure. Conversely, continued wrong posture, if sufficiently pronounced, is likely to distort the foot and also the shoe. Not only will you be guarding your health, but you will be saving money when you choose properly fitting shoes.

Many persons apparently do not recognize the relation between a normal condition in the muscles of the leg and the condition of the foot. But we find defects in the shoe whose origin may not improperly be traced to the fact that the wearer has not kept his leg muscles in

good condition. Perhaps he has not exercised them properly, or has strained or weakened the muscles of the leg through constant standing in one position in his daily work. You can usually see many cases of distorted shoes in factories where large numbers of workers are on their feet all day.

REQUIRES NO KEY 9/1

Affording more than 13,800 combinations, a three-dial auto lock now on the market is so adjusted that the driver must lock the car in order to stop the engine,



thus insuring security automatically. It has no key, springs, cogwheels or tumblers, the action being obtained

through a coil which is connected up with the starting mechanism and is inclosed in a strong metal box to prevent tampering. The lock is designed to be placed near the dashlight so that the combinations can be set at night

Ince - \$ 20.00.

y are

1/2 Adelyward Californics



Just to see if parachutes will open as they should, a California man permits himself to be blown over a cliff several times a day, trusting that the support will save him from death or serious injury when he lands at the bottom, 200 feet below. With the harness strapped securely to him, the daring jumper steps into the path of a powerful wind current caused by a motor-driven fan at the top of the cliff and near its edge. If the parachute is properly constructed, the blast of air will open the folds and the tester will be dragged along, suddenly swinging into space for a safe descent. At least three

try, and their commercial significance is still great, for about \$10,000,000 worth are sent to the United States yearly from foreign markets, in spite of the large local manufacture. In the last five years, bead shipments valued at more than \$50,000,000 have been imported from a score of countries, including France, Germany, Spain, Italy, Czechoslovakia, Japan and China. The most expensive varieties come from They command more than \$3 a France. pound wholesale, while the cheapest kinds bring only a few cents per pound. per-capita consumption of beads in America today is said to be larger than in any other country of the world.

Ny. J mus 12/13/25

A Radio Set for Fifty Cents

Method of Tuning Is Unusual, but Simple, and Principal Parts Are Made from Scrap

By WILL H. BATES

THE crystal set, to be described, which can be built at a cost of about 50 cents, will give good volume on local stations, and will be found an interesting experiment because of the method of tuning.

The only parts you need to buy are the crystal and holder, 4 binding posts, a small spool of No. 22 d.c.c. wire and about 8 in. of a flexible wire. They can all be found

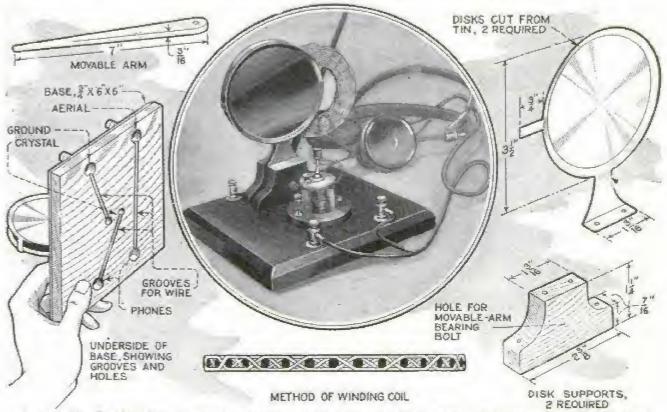
at the 5 and 10-cent store.

A 6 by 6-in. block of wood forms the base, which can be beveled on the edges, sandpapered and stained. See that it is thoroughly dried in a slow oven. On the underside countersink four holes with a 1/2-in. bit, about halfway through the wood. Then drill holes through to the top to take the binding posts. In the center of the board, drill two holes, about I in. apart, to carry wires up to the crystal. Now cut grooves in the underside of the board, deep enough to receive the wires (covered with spaghetti) as shown in the detail drawing, and run a wire from the ground post to one side of the crystal; from one phone post to the other side of the crystal; and from the aerial post to the other phone post. When this wiring has

been done, turn the board over and mount the crystal holder near the center, then connect the wires coming up through the board to the binding posts of the holder.

Two small blocks, cut out in the shape shown, are mounted on top of the base just back of the crystal. The movable arm between them is held in place with a machine screw, and is tightened with a nut on the back to give the proper tension. This arm is made out of a thin piece of wood, about 166 in. thick, flat on the end drilled for the screw, and rounded out with a knife in a tapered effect, so that it may be pushed through the openings in the low-loss spiderweb coil.

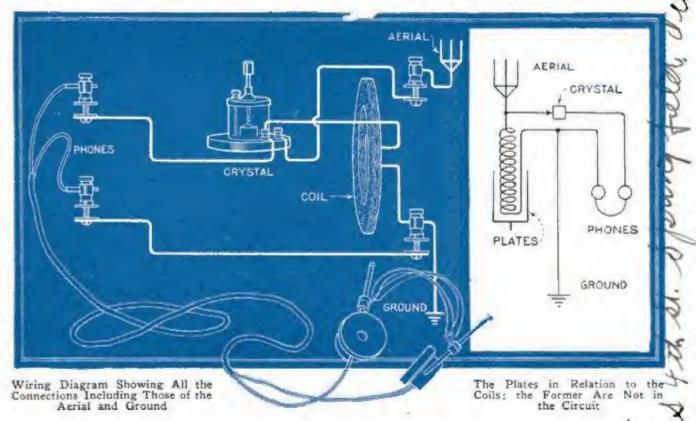
The two metal disks can be cut out of a sheet of tin or brass, or even from the lids of tin cans, as was done in the set illustrated. One should have a strip ½ by ¾ in. projecting at the side, as shown, which is used to bend around the edge of the other and hold the two together. They should be just a trifle larger than the coil, or about 3½ in. in diameter. Mount them on the two little blocks, flush with the inside edges, so that they fit close to the coil when it is moved up between them.



Construction Details of the Crystal Receiver; the Edge of the Coil Is Shown to Illustrate How the Winding Appears on the Finished Coil; Insert, the Finished Set, with Headphones Connected

with 17 or 19 spokes, which can be re-

The coil is wound on a spiderweb form station if it is within a few blocks of you, but even so, it will be found a very inter-



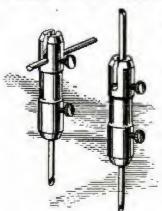
moved afterward. Use the "over two and under two" method in winding. 44 turns will be needed. A few more turns might be put on so that one can experiment by connecting the coil in the circuit, and take off one or two turns at a time until the local station with the highest wavelength comes in good and strong with the coil extended entirely out of the metal disks. The 44 turns were found to be about right for station KYW with a wavelength of 535. If you have no station with a wavelength as high as that, cut down the number of turns, as there is no advantage in having more turns than actually needed, unless you want to "fish" for distance, which is usually very uncertain with a crystal set. When the right number of turns has been found, remove the spokes and tie in the usual way. Solder the flexible wires (4-in. lengths) to the ends of the coil, and connect one end with the crystal and the other with the aerial binding post.

The coil is tuned by moving it up between the two metal plates. These plates pick up the stray eddy currents or the magnetic field thrown out around the coil. By absorbing these currents, it acts much the same as though the coil was being cut down by means of taps.

The set will be fairly selective on stations that are several miles away. You will not be able to tune out a powerful esting experiment in one phase of th mysteries of radio.

Handy Connectors Make Wiring Easy

Handy connectors that simplify the wiring of the set are now available. They



626

are quickly and easily attached, and, ? need no soldering Two ways of using C them are shown in the illustration. At right angles, on & end connection may be made ? through the slotted end without cut ting the wire already in place. The setscrews make

good electrical connections, and the ab= sence of soldering flux adds to the efficiency of the set.

Cuffs for Frayed Terminals

When using covered flexible wire in the set or on loop terminals, the fabric covering often frays, making a ragged-looking connection. This can be prevented by placing a short cuff of spaghetti over the end of the wire before soldering the joint.

Wire Fence Is Good Substitute for Ground

Wire fences are very good substitutes for grounds, especially in dry, sandy countries, where damp ground connections are not available. This is a handy thing for the tourist and camper to know, as it is a very simple matter to fasten the ground wire to a near-by wire fence and obtain good results, without the necessity of driving a rod into the ground, which would often be ineffective. The wire fence also acts as a counterpoise, forming a condenser of which the ground is one plate and the fence the other. fences, in fact, often make better grounds than water pipes. Farmers who have difaculty in locating good grounds will also find springs and streams useful. wire strung along the bed of the stream, will often be very effective.

Resistance Unit Adapts Charger for Wet B-Batteries 5 95.00

A tapped resistance unit, designed for use with the recent models of a.c. battery chargers of the tungar type, so that storage B-batteries can be charged at their proper rate, has lately appeared on the market. In addition to the rectifying tube in these chargers, a standard lamp

socket is provided, into which the resistance can be screwed to reduce the charging rate to suit the size of the battery being charged. When radio B-batteries are to be charged, the rate must be re-

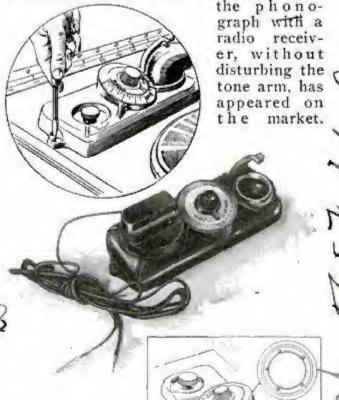
duced for the small battery plates. To this end, a resistor is needed, and a separate terminal is provided on the charger for the histor voltage required.

Variable Resistance Controls Horn Volume

A variable resistance of the carbon-pile type can be used to control the horn volume without disturbing the balance of the circuit. This unit may be connected across the output terminals; is mounted on the panel at a convenient point or placed on a long flexible lead, so that the volume of the set can be controlled at a distance, if desired.

Device for Shifting Horn from Radio to Record 680

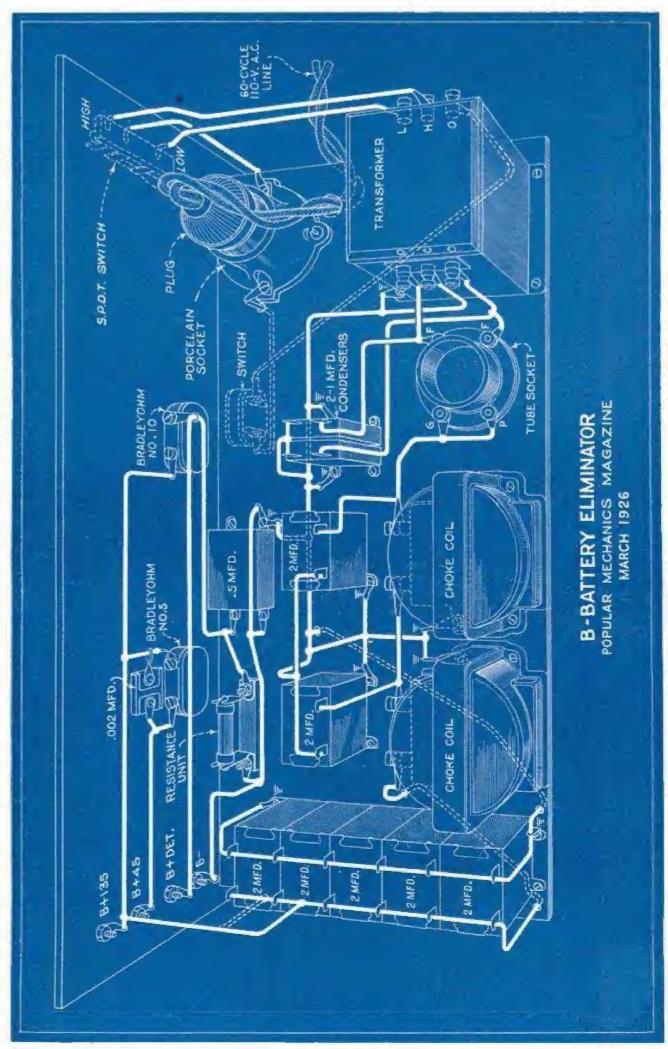
A new device for shifting the horn from the radio set to the record, in combining



Handy Attachment Shifts Phonograph Horn from Radio to Record; Above, Fastening Unit in Place; Below, Adjusting Setscrew Holding Tone Arm in Place

This handy instrument can be fastened to any phonograph with the aid of a screwdriver in a very few minutes. It consists of a microphone and cord for connecting to the radio set, a dial, marked radio on one side and record on the other, and a mounting base for the tone arm. The tone arm is removed from the phonograph by taking out the three screws that hold it; it is then separated from its base by loosening the little screw at the top of the bracket, and the device is then mounted on the phonograph over the opening where the tone-arm base was before, in the manner shown in the upper illustration. The mounting receptacle is a reproduction of the tone-arm base. The ring containing the five bearings is placed under the tone arm which is then placed in position and the pin and setscrew adjusted as shown in the lower illustration. Shifting the dial now changes the phonograph horn over from the record to the radio set and the usual bothersome disconnecting of the microphone unit is no longer required.

delectron



How to Build Your Own B-Eliminator

By F. L. BRITTIN

ONTRARY to general opinion a Beliminator cannot be built up from the usual three-element tube, a spark coil and a few common condensers. Every part must be specially built, the condensers must be able to carry the load, and at the same time small enough to permit compact assembly. Such parts being available now, the radio fan can build his own B-eliminator so as to deliver up to 180 volts if desired. The instrument to be described works smoothly without the slightest hum when properly constructed, and B-battery troubles are permanently eliminated. Full-strength B-voltage is always on hand, resulting in maximum efficiency of the set at all times. The source of supply is the 110-volt, sixty-cycle a.c. house-lighting current, and the eliminator can be plugged into any convenient wall

We have shown two types of the eliminator to permit our readers to choose the one best suited for their needs. The circuit of both is practically the same. The arrangement shown in the large blueprint was built up in our laboratory for sets of the superheterodyne type requiring a va-

riety of voltages. A standard - size bakelite panel is used, so that the device can be placed in a cabinet if de-This sired. panel is % by 7 by 18 in. The subpanel is 3/16 by 9 by 17 in., and is mounted on brackets, 2 in, above the base of the. cabinet, in the manner shown in the illustration. Note that the push - pull switch is the only instrument mounted below the sub-The panel. photo of the

front panel and the completely assembled instrument will give the reader a good idea of the neat and compact arrangement. The various voltages indicated on the front panel are especially suitable for

the 1926 model of Popular Mechanics superheterodyne. Control No. 1 is for the first detector and oscillator plate voltages; No. 2 controls the intermediate voltages, and the maximum voltage is taken from the upper binding post. This voltage can be either high or low, depending on the way the small single-pole, double-throw switch, shown on the left side of the panel, is thrown. The position of the instruments on the front panel can be changed to suit the builder, but it is necessary that the instruments on the subpanel are arranged in the manner shown for best results, as it is essential to keep the input and output separated as far as possible.

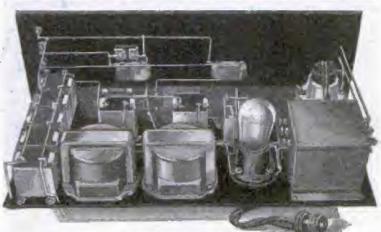
The fixed condensers may be of any good type, but it is very important that they be of the highest grade, and should be tested to 800 volts at least. The five 2-mfd, fixed condensers placed across the output make for good quality, permitting the low notes to come through the set. The porcelain socket is of the common variety. Twisted lampcord of the length required is connected with a plug at each end and run through a hole in the sub-

panel directly back of the socket, then taken out at the rear of the instrument. In connecting the B-eliminator to the set, either use a cable or bind all the wires closely together in cable form.

By following these instructions the eliminator can be placed as near or as far from the set as desired. When throwing the S.P.D.T. switch from low to high voltage, it will be necessary to adjust

sary to adjust the No. 1 detector voltage. A C-battery is always advised with any radio set using audio amplification. The table at the end of this article gives the values to use with this eliminator and different types and





Rear View of Finished Instrument, Showing Compact Assembly; Above, Details of Front Panel with Controls Plainly Marked

combinations of vacuum tubes. The material list specifies the types of materials used in the models tested out in our

laboratory.

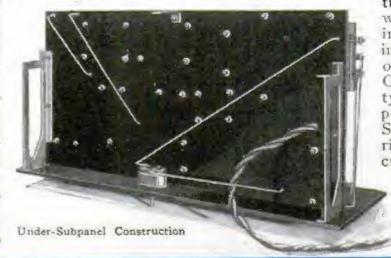
The breadboard arrangement of the eliminator is for those who wish a simpler and cheaper type, suitable for sets requiring but three B-battery terminals, namely B—, Det. B and Amp. B. The board is ½ by 7 by 23 in. in dimensions and the same instruments are used with the exception of the No. 5 Bradleyohm and the .002-mfd. fixed condenser. The S.P.D.T. switch may be of the cheap porcelain type. The binding posts are mounted on strips of bakelite raised ½ in. at each end of the

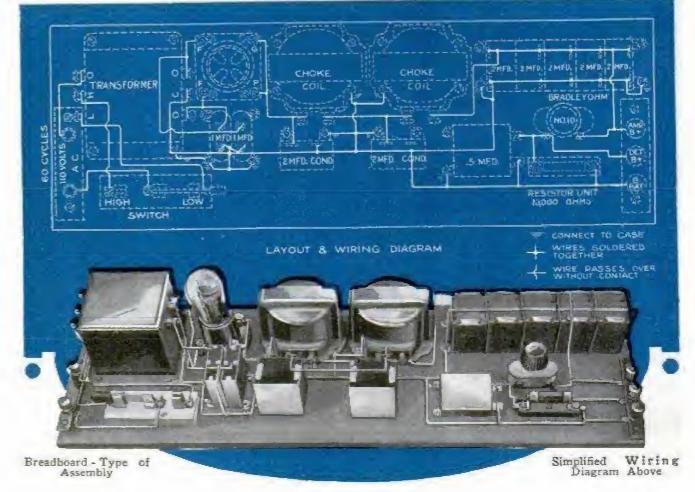
board. The wiring diagram is given above the photo of the completed instrument. This breadboard assembly can, of course, be arranged for the additional 45 - volt terminal if desired, but the panel and subpanel design takes up less room and improves the appearance. In both wiring diagrams the points to be grounded are marked with the usual ground symbol. These are not external grounds, however, but circuit grounds to the metal shells of the instruments, and are necessary to obtain good results.

In operating a device of this kind, it is always well to remember that it is connected to the power line, and like any other device operated by the house-lighting current, it should be turned off before handling any part except the insulated controls on the front panel. The push-pull switch on the front panel is used for this purpose. Do not forget to

turn this switch off when the set is not in use; this is just as important as turning off the A-battery. On the breadboard type of eliminator, pull the blade of the S.P.D.T. switch upright to shut off the current. The elim-

inators use very little house current, and when correctly built, with the mate-





rials specified, give excellent re-There is no upkeep exsults. pense, as the tube and other parts are practically indestructible.

A large blueprint of both circuits can be obtained from the Radio department of Popular Mechanics Magazine, 200 E. Ontario St., Chicago, for 15 cents. Specify blueprint No. 106. Electus Co, Esenoa, a eq

C-BATTERY VOLTAGE

TYPE OF TUBE	NUMBER OF TUBES IN SET															
	WITH LOW-VOLTAGE TAP								WITH HIGH-VOLTAGE TAP							
	1	2	3	4	5	6	7	6	ī	2	3	4	5	6	7	8
UV-201A1 C-301A	p# 5	9	25	6	4.5	3	1 5	1.5			19	16.5	15	12	105	9
UV-199 OR C-295	16	15	13.5	12	10,5	75	60	45								21
201-A PLUS ONE UX OF 301-A - CX-112		7.3	6	Ġ	4 3	3	15	1 3		19	16.5	15	13.5	12	10.5	9
UV-199 PLUS ONE UX OR C-299 CX-220		13.5	12	10.5	7.5	6	6	4,5							2)	18
CX-FIZ OR UX-112	9	7.5	Б	4.5	3	1 5		-	19	16.5	13.5	12	12	9	73	6
CX-IZO OR UX-IZO	15	12	7 5	6	3	1 3		-	-			21	15	12	10.5	7.5

MATERIAL LIST

- 1 bakelite panel, 3-16 by 7 by 18 in, 1 bakelite subpanel, 3-16 by 9 by 17 in.
- Benjamin subpanel brackets.
- socket, common porcelain type. fixture plugs of the pull-apart type.
- 6 ft. lampeord,
 1 Cutler Hammer push-pull switch.
 1 Acme B-4 transformer.
 2 Acme B-2 choke coils.

- Raytheon tube.
- standard tube socket.
- 7 Tobe-Deutschmann fixed condensers, 2 mid. 2 Tobe-Deutschmann fixed condensers, 1 mid.

- 1 Tobe-Deutschmann fixed condenser, .5 mid.
 1 Bradleyohm variable resistor No. 10.
 1 Bradleyohm variable resistor No. 5.
 1 Bradley fixed resistor unit, 8,000-10,000 ohm.
 1 fixed condenser, .002 mid., any good make.
 1 Marco S.P.D.T. switch.
 4 binding posts with engraved tops.
 39 round-head, brass machine screws, 6-32, ½ in. long.
- round-head, brass machine screws, 6-32, 1 in.
- doz. soldering lugs. two-foot lengths No. 14 round, tinned-copper busbar wire.

New Jack Controls both Amplifier Stages

A two-stage jack which has been marketed recently, is novel in that it may be used in a receiving set for controlling either one or two stages. By inserting a plug into the jack until the first notch is encountered, one stage of amplification may be cut into the circuit, and by pushing the plug all the way in, both stages are automatically connected in it. This elimmates an extra jack and the volume is controlled by a single operation.

Switch Locks Set and Prevents Unauthorized Tampering

The radio-battery switch shown in the drawing assures the operator that no one will tamper with the set during his ab-

When the shale is pulled halfway out, the

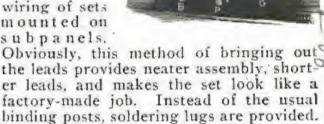
sence. This will prove a boon where children are apt to turn on the radio set and leave the tubes burning after they have finished listening in. The nickel shaft of the switch shuts off the battery current when it is pushed all the way in.

LOCKED

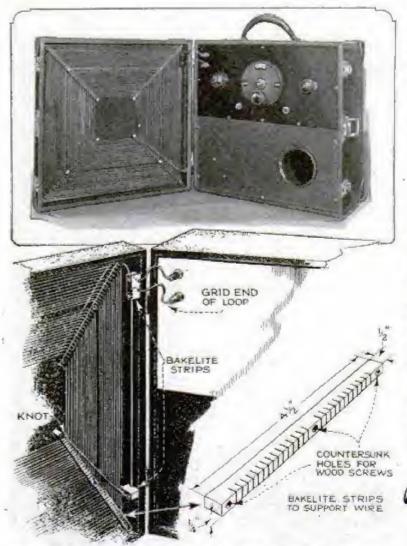
current is turned on. The shaft can be pulled all the way out of the switch and carried in the pocket of the owner, in the same manner as he would use his auto key. The A-battery is then shut off and the set cannot be operated until the "key" or shaft is replaced.

Audio-Frequency Transformer Simplifies Wiring

An audiofrequency transformer furnished with leads coming out of the base is intended to simplify the wiring of sets mounted on subpanels.



[German telegraph authorities are making preparations to establish radio-telephonic communication between liners atsea and telephone systems in Berlin; Bremen, Hamburg and other German towns, via the radio stations at Norddeich, Cuxhaven and Swinemunde.



Loop Built in Lid of Portable Cabinet Is Adjustable for Directional Effect

Built-In Loop for Portable Set

A good loop of the pancake type can be built in the lid of a portable receiver cabinet as shown in the illustration. The lid can then be adjusted in any position for directional effects. A loop of this kind takes up very little space, and is much handier than the folding type. Four strips of bakelite, 4½ by ½ by ¼ in., are

slotted to take the loop wire easily. These slots can be cut with a circular metalcutting saw and should be deep enough to take the The turns wire. should be spaced about 1/2 in. apart. and from 80 to 85 ft. of stranded silkcovered loop wire is used. The bakelite strips are countersunk for wood

RED WHITE BLUE GREEN

BLACK BROWN YELLOW

Safety Attachment Caps, in Seven Colors, Identify the Leads to the Set; Left, Binding Post with Cap

screws and mounted in the lid as shown. The wire is then wound on and the ends brought out through insulating blocks of bakelite to the cord-tip plugs. Note that the grid end of the loop is taken from the inner turn. Sufficient wire should be left at the loop ends so that the lid can be turned out as required.

Drilling Wood or Bakelite without Splitting

Holes can be drilled in wood or bakelite panels without risk of splitting out ragged holes on the underside, if a little care is takens Always drill the hole from the front side of the panel and clamp the piece to be drilled tightly against a piece of wood of similar. size and about 1 in. thick. This prevents the chips on the underside of the panel around the hole from breaking away. Use sharp drills, and a tapered reamer in cases where it becomes necessary to enlarge the hole beyond the size of bits on hand.

Colored Caps Indicate
Leads to Set

Attachment caps made in seven distinctive colors, to indicate the

different connections to the receiver and battery leads, are now available. They will fit any standard binding posts by removing the post screws, and replacing them with the screws of the attachment cap, or they can be used as a binding post by putting the screw through the panel and fitting a hexagon nut underneath. The threaded ends of the colored caps match the colors of the battery cables now in

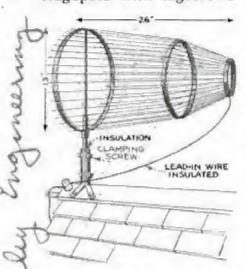
use, making it practically impossible to connect the set wrong. The caps are covered with insulating material, so that it is not necessary to keep them separated.

■Radio station LRT, being installed on the South Orkney islands, is said to be the southernmost broadcasting outpost. Steam Heat Improves Radio Reception by Keeping Set Dry

Moderate dry heat in the house improves the performance of the set, as it reduces the humidity. The effect on the radio set is to drive the dampness out of the coils, and other parts, with the result that the set becomes more sensitive. The preceiver of the future may be so designed as to exclude dampness and this would be a great improvement. Artificial heat could even be applied to the set at intervals to obtain the same result. Some of the early instruments were built in separate. sealed boxes with the tubes in a sealed compartment. This idea may be revived. A common light bulb could be mounted in the set, which would radiate enough heat to keep away moisture. In warm, damp climates this trouble is a real problem and these suggestions should be beneficial. When coils, transformers, rheostats and other parts collect moisture, the set is often permanently injured.

Novel Aerial Is Easily Installed

An aerial so shaped that it is easily installed in limited spaces is now available. It is claimed to be more selective than the usual type, limiting interference without reducing volume. It is mounted on the ridgepole with lagscrews in the manner



shown in the illustration. and can be turned in the desired direction and locked in place. This feature is of value as the aerial can be placed at right angles to any power line. The lead is taken to an insulator and

down over the edge of the roof in the usual way. An aerial of this type makes a neat appearance on the building; eliminating the use of unsightly poles and long wires.

¶LOUD SPEAKER AND AMPLI-FIER FOR THE CRYSTAL SET. A novel and effective instrument described in the April, 1925, issue. This number may be obtained from the Circulation Department, price 25 cents. Radio Set Built like Lamp

Has Horn in Base

A radio set built in the form of a table lamp with the horn concealed in the base is a recent novelty. The instrument com-



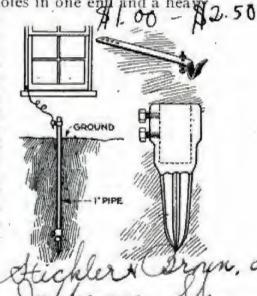
Upper Part of Lamp Shade Raised, Showing Instrument Panel, and Left, Closed for Use as Lamp

bines in one compact unit a three-tube receiver, a loud speaker and a table lamp. The lamp is built of copper, finished in either gold, silver or bronze to harmonize with various interiors. When the instrument is closed, no one would suspect that a complete three-tube reflex receiver was concealed within.

Attachable Peg for Ground Pipe

A peg for the end of the ground pipe to make it easier to drive the pipe into hard soil, has been marketed recently. This simple attachment is screwed to the end of a 6-ft, length of 1-in, pipe which is placed as close to the house as possible. A ground clamp, consisting of a strip of copper, with holes in one end and a heavy.

bolt in the other, is also a vailable. This is fastened to the top of the pipe along with the ground lead from the set and lightning arrester. The installation is clearly shown in the drawing

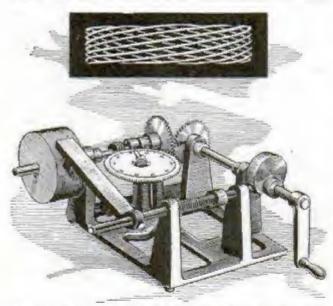


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482 A POPULAR MECHANICS

Handy Machine Winds Low-Loss Coils

A handy machine for winding low-loss coils is one of recent novelties on the



Honeycomb-Coil Winder Showing Simple Construction; Sample of Coil Made on the Machine

market. It will wind the popular honeycomb-type coil any width from ½ to 1 in., and the diameter may be arranged to suit by putting various sizes of wooden spools on the winding spindle. The recording dial is provided with a movable pointer for counting the number of turns. The instrument is finished in black enamel and is neat in appearance.

Testing of Tubes Is Necessary for DX Reception

The ideal radio weather at hand, the set should be in the best possible condition to take advantage of distance-getting possibilities; the tubes should be tested, and if found to be of low efficiency, they should be placed in a tube booster and rejuvenated if they are of the type that can be so treated; if not, new tubes should be Radio tubes lose their effiprovided. ciency under constant use and the loss progresses to a point where the set operates very poorly and sometimes not at all, although the batteries are in first-class condition and the tube filaments apparently light as usual.

If the tubes are of the thoriated-tungsten type, rejuvenation is very satisfactory and makes a remarkable difference in the performance of the set. Most of the standard tubes now in general use, with the exception of the WD-11 and WD-12 types can be rejuvenated. This reactivating process consists in boiling thorium atoms out of the interior of the tungsten filament so that they form a new layer on the surface, making possible greater activity within the tube. This is done by operating the filament for a very short time at a specified high voltage, followed by a lower voltage. There are a number of inexpensive tube boosters available for doing this at home, the 110-volt 60-cycle house-lighting current being suitable for the work.

Approximately the same results can be obtained by operating the tube filaments in the set with the A-battery in the usual manner, the B-battery being disconnected from the set. This operation should continue for several hours, the length of time depending on the condition of the tubes.

Aerial Mast Clamps to Ridgepole

Metal aerial-mast fixtures for fastening the mast to the ridgepole of the house are now available. The fittings are adjustable to fit various types of roofs and roof pitches, and consist of a cap with a sheave pulley and lugs for guy wires, a collar with lugs and a universal masthead with loop

for attaching the aerial cable. The pipe does not require threads at either end and can be purchased from the local plumber in the length required. On einch pipe is used for the mast. By adding lengths of pipe the aerial may be made of any height, but in that. case, one guy-



wire collar should be used on each extra length of ripe to brace it sufficiently.

Colored Wires Identify Leads

If battery leads are not marked for identification, there is a chance of placing heavy voltage on the filament terminals. This can be avoided by using insulated wire with various-colored braided covering. Stranded wire of this type can be obtained in red, black, white, yellow, green and brown, and with different-colored tracer threads.

Getting Rid of the Squeals

Howls, Hums and Reradiation Are Usually Easy to Prevent with a Little Time and Effort

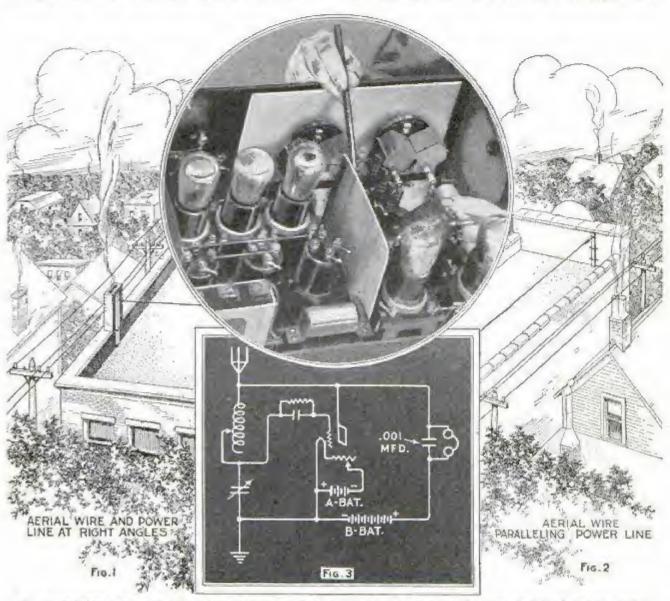
GETTING rid of squeals, howls and hums, and preventing reradiation, are topics of everyday conversation among radio fans. All are interested because these annoying ailments are so common, caused by induction from power lines, interference from regenerative receiving sets or improper tuning.

Power-line hum can usually be minimized or eliminated by running the aerial at right angles to the lines causing it, as shown in Fig. 1. Drumming noises from power lines often can be located in a leaky transformer in the neighborhood. In such cases the power company will usually co-operate to eliminate this trouble by repairing the transformer.

Squeals inherent in the set due to its design can be reduced and often elimi-

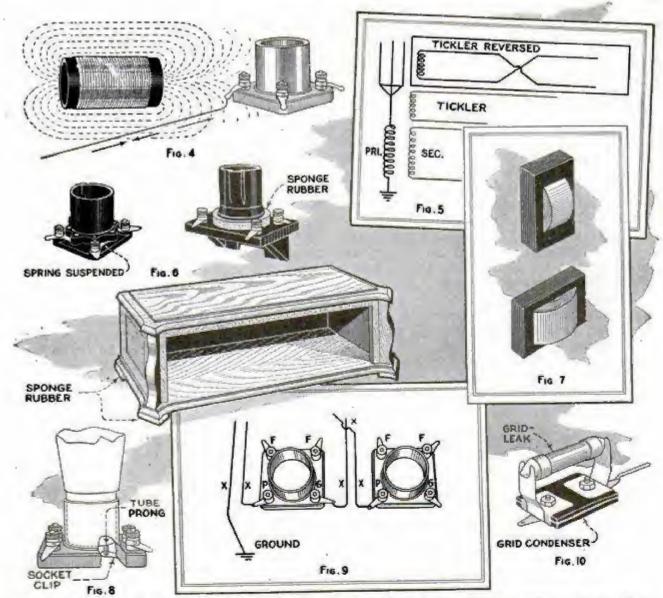
nated by properly tuning it. One-tube regenerative circuits of the kind shown in Fig. 3 are of this type. The reradiation is due to its conductive feedback into the aerial. However, this is not the only type of reradiating set that causes howls that interfere with the pleasure of other listeners within a range of several miles; all types of regenerative receivers are troublesome in this respect. Even the superheterodyne receiver, although it does not come under the regenerative heading, is a bad offender when used on an outside aerial.

In order to find out whether your set is causing such trouble, make arrangements with your neighbor to listen in to the same station at the same time. When tuning in your set to that wavelength turn



Above, Shielding Prevents Intercoupling between Transformers and Tubes; Below, Single-Circuit Regenerative Receiver, Which Acts as a Miniature Transmitting Station

483



Squeals and Howls in Radio Reception Are Often Caused by Faulty Design and Arrangement of the Instruments, Microphonic Tubes, Poor Contacts, Wrong Gridleaks and Other Errors Which Anyone Can Correct

up the rheostats to make the signal as loud as possible up to distortion. This will usually drive the tubes into oscillation. If the set is of the popular tuned r.f. type, detune the first dial, which is closest to the aerial lead-in. Then switch off the set and get in touch with the neighbor to check up the results. If he has heard a squeal while you were carrying on these experiments, and no others in the neighborhood were tuning in to the same station in this way, your set is at fault.

Advancing the rheostats too far gains nothing and shortens the life of the tubes, besides spoiling your neighbor's reception. There are several rules for proper tuning that are well worth knowing. Practice tuning in powerful stations first, and do not try to pick up weak distant stations until you become an expert and know how to control your set. Use both hands, one hand for the regeneration control, such as a potentiometer or tickler if the set has one, and the other hand for the

Keep the regeneration tuning control. control always just below the point of oscillation; the set is then in the most sensitive condition. Turn back the regenerative control as soon as the set accidentally breaks into oscillation. Tune the set so that signals will come in without a The regeneration control can whistle. then be turned up a little to increase vol-Do not try to force regeneration in an attempt to obtain loud-speaker volume from a set not designed for this pur-Do not force regeneration in an attempt to hear stations beyond the range of the set; be content with those that can be really heard.

Squeals originating in the design of a receiving set can often be traced to coupling tubes or transformers. This can be prevented by shielding these instruments, as shown in the photo insert. If the a.f. transformers are of the type shown in the upper part of Fig. 7, they should be turned at right angles to each other, to prevent

intercoupling of their fields. The lower transformer is of the vertical-core type, and turning it at right angles to another of the same type, has practically no effect, as this does not put their fields in aright-angle relation. Transformers of this type must be spaced a reasonable distance apart, but do not have to be turned. Transformers of the r.f. type shown in Fig. 4 should be placed in the set with care around coils carrying high-frequency currents, destroying the tone. transformers should be mounted in such a position that the lines of force will cut each other as little as possible. Even with this precaution, the field from the coil sprays near-by wires and pieces of apparatus, inducing current in them that often causes broad tuning and distortion with its usual chorus of howls and squeals. A new doughnut-shaped coil, called a toroid coil, which is so designed that the field is confined to the coil regardless of the position in which it is placed in relation to other instruments and wiring, will remedy much of this trouble.

Receiving sets of the three-circuit type often give poor results if the tickler coil is reversed as shown in Fig. 5, as this "bucks" the current in the secondary coil, thus neutralizing the grid circuit. Horn noises are often caused by vibration, small tubes of the dry-cell type being especially apt to cause this trouble. To prevent it, use sponge-rubber pads under the corners of the cabinet, or use shock-absorber sockets of the type shown in Fig. 6.

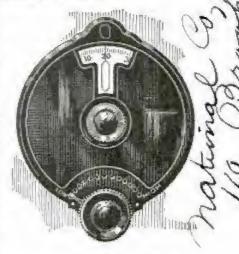
A common source of trouble is poor contact of the tube prongs with the socket clips. Pull up the prongs of the socket with a stout string, replace the tube and reinsert the socket. A sectional view of the socket is shown in Fig. 8. Plate and ground leads running parallel as shown in Fig. 9, and plate leads touching grid leads, or running close to them, will cause howls. Keep such leads separated as

far as possible, and when necessary to cross them, run the wires at right angles. Fig. 10 shows the common type of grid condenser and leak: trouble can often be traced to a defective condenser. It may have been ruined by excessive heat when soldering, and as a precaution against this,

soldering lugs should always be fastened to such condensers by means of two short brass machine screws, and the wire should be soldered to the end of the lug before the lug is screwed to the condenser. The gridleak may have too much or too little resistance; try different resistances until one is found that gives the best results.

Vernier Dial Has Device for Changing Ratio

A new dial is provided with a device for changing the ratio. It is designed for mounting on the shaft of any standard condenser without the use of tools other than a screwdriver, and can replace the dial on any re-

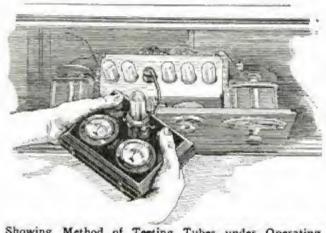


ceiver where sharper tuning is desired. The ratio-changing device provides for any ratio between 6 to 1 and 20 to 1.

668 Combination Tube Tester

An instrument which not only tests tubes under operating conditions but can be used to locate trouble in the set has lately made its appearance on the market. The illustration shows the method of reading the plate current of the tubes in milliamperes. The instrument is also provided with a combination plate and filament voltmeter for testing the A and B-battery voltage. In addition, it can be used to locate defective tube sockets, open circuits in transformers, poorly soldered

joints in the circuit and defective contacts in the jacks. A tube tester of this type is really necessary to get the best results from any multitube set; one poor tube may spoil the reception in an otherwise perfect instrument and a check on the A and B-batteries is desirable at all times.



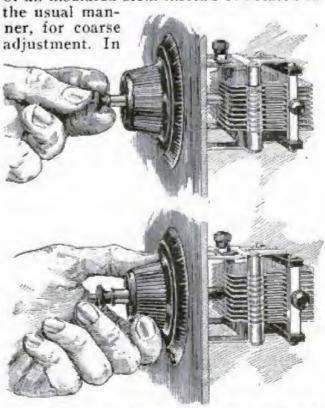
Showing Method of Testing Tubes under Operating Conditions with Combination Tester, and Trouble Finder

1283 Profeel are

486 1314 Sedgwich St. POPULAR MECHANICS

Push-Pull Adjustment Features
Variable Condenser

In a new variable condenser the movable plates are pushed or pulled by means of an insulated stem instead of rotated in



Above, Moving the Plates with the Stem for Coarse Tuning: Below, Fine Tuning with Dial

addition to this, very fine adjustment can be obtained in the usual way, by means of a dial. A micrometer screw coupled with the mechanism permits a movement of only .0001 in. Graduations on the stem are numbered 1 to 10 and on the dial from 0 to 100. The claim is made that body capacity and losses are reduced to a minimum. The movable plates are connected electrically to the frame and are grounded, and the fixed plates are 2 in. from the inside face of the panel.

Testing Audio-Frequency Transformers

A simple way to test a.f. transformers that are suspected of being grounded to the shell or frame, is of interest to all who have encountered such trouble. Connect one tip of a pair of headphones to the 16½-volt terminal of a 22½-volt B-battery unit, and the 22½-volt terminal to a short length of insulated wire. Without touching the bare wire with the hand, hold it against the case or shell of the transformer, being sure to make contact with the bare metal. Touch the free terminal of the headphones to each trans-

former terminal on the side of the transformer to which the wire is connected. Repeat this test on the other side of the transformer. A distinct click indicates that the terminal to which the connection is made is grounded to the frame. A similar test with the battery and phones can be used to locate an open circuit in the transformer; if there is no click in the phones when the connection is made across the coil, the circuit is open.

Good Ground Increases Efficiency

The radio set's efficiency can be increased from 25 to 100 per cent by the proper installation of a suitable ground. Many enthusiasts take great pains to erect a good aerial, then make the mistake of twisting the ground wire around a steam-radiator valve or gas pipe, and wonder why the results are not what they should be. A cold-water pipe makes a good ground under most conditions, but not always. The actual ground connection begins where the lead wire enters it. This means that if the water pipe is on the third story, the lead to the ground would be too long to be efficient. In a case of this kind it would be better to place a counterpoise under the aerial. When connecting the ground lead to a water pipe, always use a ground clamp.

Portable Lamp for Radio Receiver 5 7 Q Is Run by A-Battery

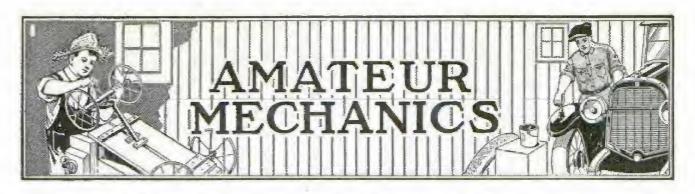
A small portable radio lamp, which is connected directly to the radio A-battery, is now available. It is designed along the



lines of a standard desk lamp, and supplies just the right amount of illumination for easy dial adjustment when placed on the cabinet, as shown in the insert. The eyes are shielded from the direct

rays, and the lamp adds to the appearance of the set. As it is provided with a long cord, it also makes a good trouble finder. A switch is placed in the base. The lamp is a 6-volt automobile bulb and thus draws very little current from the A-battery.

Jadie Co 62 550



Taking Care of the Umbrella

By FRANK V. FAULHABER

BECAUSE an umbrella does not close as it should, a rib perhaps tearing into the covering, the user in his hurry and impatience often discards it without attempting to repair it. Usually the trouble is merely due to a broken rib or a rusty, broken wire, which might have been avoided with proper care. The life of an umbrella can ordinarily be lengthened and

the user can get much more service out of it by keeping all the joints oiled to prevent them from rusting. Use a small oilean and put a drop or two on each joint, holding a small piece of cloth or paper under it to prevent getting oil on the covering, as shown in photo No. 3. Care must also be taken not to get too much oil on the joint, or it will run off on



the covering after the umbrella has been put away.

In some instances, where the enamel has peeled off the ribs, it is good practice to touch up these spots with a little quick-



Rethreading the Ribs on a Thin Flexible Wire at the Sliding Sleeve Joint

drying black enamel or paint, applying it with a small camel's-hair brush, as shown in photo No. 2. Rusty joints become broken joints sooner or later, so preventing rust is, in most cases, preventing breaks, and your umbrella will last much longer. Oil should also be applied at the joint where all the ribs are attached to the sleeve at the handle. A thin, flexible wire holds the assembly together at this point.

When it is necessary to replace a broken rib, cut the threads that hold it to the covering. Do not pull the rib out, as the covering can easily be torn, especially if it is old. It is necessary to remove the

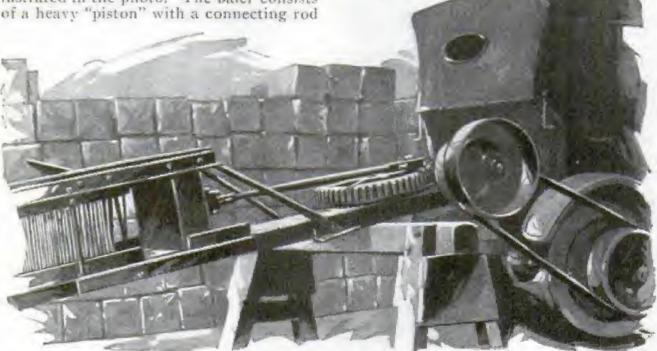
wire where the rib is fastened to the sliding sleeve. Take the other ribs off until the broken one is free, and after substituting a new one, rethread the ends of the ribs on the wire in their proper order. Should a new length of wire be necessary, use a flexible one, the same size as the old one and about 4 in. long. Threading the wire through the eyes of the ribs can be done best with the fingers, as shown in photo No. 7. Twist the wire tight with long-nose pliers, cut off the end and bend it down. This operation is shown in photo No. 6. When doing this, it will be found convenient to have a hole in the bench top, into which the ferrule of the umbrella is set to hold it vertically, as in photo No. 1.

Umbrellas are often opened in a hurry; the sliding sleeve is forced up before the covering has a chance to loosen, as shown in photo No. 4. This practice is the cause of most bent ribs. As soon as a rib is bent the umbrella does not open properly and by forcing it still more, other ribs may bend and break, or the covering may be torn by the strain. The proper method of opening an umbrella is shown in photo No. 5. Hold the umbrella down, twist it around a few times to loosen the covering and it will almost open of itself.

"Baling" Empty Tin Cans

One junk dealer who bought up all the large square tin cans he could obtain used the ingenious method of baling them illustrated in the photo. The baler consists of a heavy "piston" with a connecting rod

which is fastened close to the rim of a large cog wheel to give a long stroke. This is so proportioned that the cans are compressed enough to admit another one



Old Tin Cans in Junk Yard Are Flattened for Baling by Means of Unusual Device Belted to the Rear Wheel of Automobile

at every stroke, and is run by a worm gear connected to a pulley on the rear wheel of the auto as shown. The piston

slides in a steel frame of the proper size to fit the cans. When these are inserted in the frame and the baler is started running, the piston flattens them against the solid back of the frame. On each backstroke of the piston a can is inserted at the front end. The capacity of the baler is 40 cans, which are then tied up, forming a conveniently handled bale. The machine is mounted on a heavy piece of timber, and when in use, one end is placed on an ordinary sawhorse as shown.

Removing Stamps from Envelopes

When you wish to save a stamp affixed to an envelope, do not attempt to remove the stamp

from the envelope but remove the envelope from the stamp. Turn the envelope with the stamp down on the desk or table, then, keeping a fairly heavy pressure on the stamp, roll the envelope up and away from it. This is much more easily done than described, but a few minutes' trial will show how it is accomplished. It is not necessary to touch the stamp. If it happens, as is very likely, that a portion of the envelope remains on the stamp after it has been removed, roll the envelope portion off the stamp in the same manner.

—F. C. Avery, Chicago, Ill.

Safeguarding Children

Small children often fall against the stove and are then severely burned. Such accidents can be prevented by simply pro-

viding a fence around the stove as shown in the drawing. This can be made out of strips, l in. square. A baby's play yard will be just as useful for this purpose as a handmade fence. It should be fastened to the floor with screwhooks and eyes so that the children cannot move it .-W. C. Ratcliffe, Tannersville, Va.



Small Baby Yard, Set around Stove, Prevents Accidents



Novel Diving Platform

At Sulphur, Okla., there is a huge swimming pool fed continually by a spring of warm sulphur water. The water is crystal-clear, and people from far away come to use the pool for bathing. A diving platform is built in the pool of concrete blocks, forming a half-circle with convenient steps from the water's edge to a height of 8 ft. above the surface. This type of platform induces patronage and tends to increase one's skill in diving as the bather is tempted to try one step higher. Painted white and having an electric light on a pole at the top, the platform presents

a neat appearance.

—Dale R. Van
Horn, Walton,
Nebraska.

(A quantity of coarse excelsior, kept in a convenient box in the garage or workshop, will prove very efficient in cleansing hands of grease and oil. Dip a handful of the excelsior in water, rub soap into it and use as a brush.

Filling the Gasoline Tank

Every tourist and auto driver who has had occasion to pour gasoline into the tank on the road appreciates the diffi-



culty of doing this without the use of a funnel. Still, it is hardly advisable to take a funnel along just for this purpose, as it takes much room and may be bent and broken. However, the motorist usually carries a gallon oilcan to get gas in and a piece of old inner tube can readily be obtained. Cut a slit in it to fit over the opening in the can, and it will be an

easy matter to pour the gas into the tank, as shown in the illustration.

Burl from Tree Makes Case for Clock

As the accompanying photo shows, a pleasing case for a wall clock can be made from a burl cut from a tree. A burl is a kind of outgrowth caused by a number of branches trying to grow out of the same

place at once.
Burls of fair size are rather plentiful, and no two are ever quite alike.
The burl is sawed from the tree in the same manner as a branch, the cut side providing a flat surface to hang against the wall. The

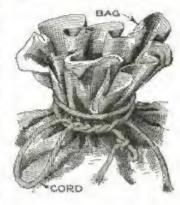
bark is then

removed to expose the twisted grain underneath. An inexpensive alarm clock can be used if desired, and no change need be made in it other than removing the feet and the handle on top. A hole to fit the size of clock used is then cut through the burl, and the clock set in place. It should be so fitted that it will slip in and out of place easily, so that it can be wound and set. A small piece of tin, bent in a curve and with one end fastened in place of the handle, will serve as a spring and help keep the timepiece in place. The burl may be stained and varnished if desired, and this will bring out the peculiarities of the grain.—C. L. Meller, Fargo, N. Dak.

A Quick Bag Tie

The knotted end of the cord is the key to the "quick-off" feature of the tie illustrated. Farmers can use the twine from bundles of grain, cut near the knot; others can quickly make a knot at the end of any cord. The tie holds as securely as any when tightly drawn, and can hardly be equaled when it comes to untying quickly; it can, in fact, be untied and removed with one hand and at a single pull. The tie is begun by laying the knotless end of the string about the gathered mouth of the bag, leaving quite two-thirds of the knotted end to work with. After the first

loop has been thrown around the mouth of the bag and drawn tight, the tie is finished by passing the knotted end once more around the bag, looping it back, passing the looped end about the other end of the twine twice, and



then pulling the knot tight by tugging hard at the loop and knotless end. On the other hand, it is evident that untying of the knot requires only a slight pull on the knotted end.—Louis Schneider, Clinton, Mo.

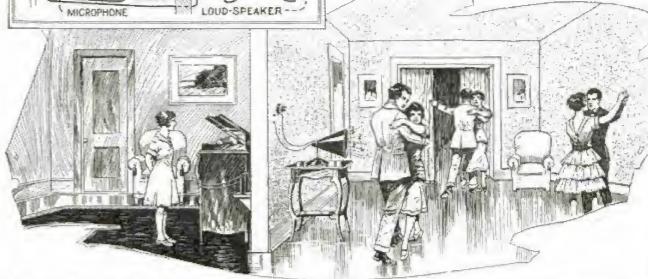
Aspirin Revives Flowers

Aspirin, a coal-tar product, is used at the Emergency hospital of Dallas, Tex., to freshen and to revive cut flowers sent there to cheer the patients. The experiment has proved entirely successful with cut roses. The flowers are placed in a pot containing water and are not treated with aspirin until they show signs of wilting. A five-grain tablet of aspirin dropped in

PHONOGRAPH 10-0HM RHEOSTAT 4-0HM RECEIVER WOOD DRY/ CELLS MICROPHONE LOUD-SPEAKER--

Phonograph Provides Music for Two Rooms

The diagram shows a simple method of relaying phonograph music from one room to another. This hookup is useful at parties where two rooms are used for



Relaying Phonograph to Another Room for Dancing by Means of an Improvised Arrangement, Consisting of a Telephone Microphone, Dry Cells, Rheostat and Receiver, Fitted to a Tin Horn

the water refreshes them. Another tablet is later placed in the water and the flowers are again refreshed. The operation may be repeated several times.—William Allen Ward, Dallas, Tex.

Repairing Pumps

When repairing pumps, I have found that, where there is a cement platform and bolts set in the cement, these bolts are in the way of the pump dog when the pipe is taken from the well, and may be bent or broken. To avoid this, I set ½-in. bolts in the cement when construction is done.

These bolts are set back from the pump base, and steel straps are used to hold the pump in place. This gives plenty of room for the dog and the 1/2-in. bolts are not so likely to be broken or twisted off. It is well to coat the bolts with a thick paint when the nuts are replaced so as to prevent rusting .-W. O. Hendrickson, Argyle, Wis.

dancing or in case those who do not dance wish to listen to the music in another room. A microphone is placed at the mouth of the sound chamber of the phonograph, as shown. Four to eight dry cells are used and a 10-ohm rheostat is connected in to regulate the current. A loud speaker can easily be made from a tin horn and a telephone receiver wound to a resistance of about 4 ohms.

Support for One-Man Saw

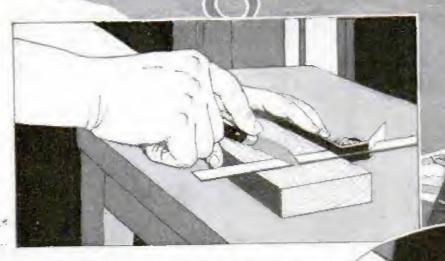
Little difficulty is usually experienced in sawing horizontal timber, but to sup-

port the saw in a working position when cutting down trees is difficult. A simple support for this purpose can be made from a length of Me-in. round steel rod, commonly called pump rod. It is sharpened at the ends and bent to the shape shown. This device is driven into the tree and supports the saw properly without interfering with the "set" of the teeth.



Handy Support Facilitates Sawing Trees Single-Handed

Making Mortise and



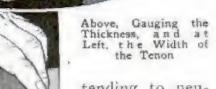
Squaring around the Rail for the Shoulders of the Tenon

THE old adage, "well begun is half done," applies particularly to the making of woodworking joints, and since no work can be perfect, errors and irregularities must constantly be reckoned with. It is, therefore, very important that laying out be care-

fully done; and that the processes follow one another in the correct order.

A simple form of the mortise-and-tenon joint is one in which the sides of the two members come flush, as in the meeting of the stile and rail in a door, and the method of setting out and making

this joint is as follows: Surface the best side of the rail stock and mark it lightly with an "X" for an easy identification as the face side. Joint a good edge with the plane, testing for squareness with the try-square, holding the handle of the square against the face side. Mark this edge also with an "X." Next square the other edge and lastly the other side. The natural impulse is to take the four sides in rotation, but this is almost sure to bring poor results. Very accurate indeed is the surfacing of a piece of stock to within 164 in. of squareness or parallelism, so that, in squaring in rotation, the errors are continued in the same direction, instead of



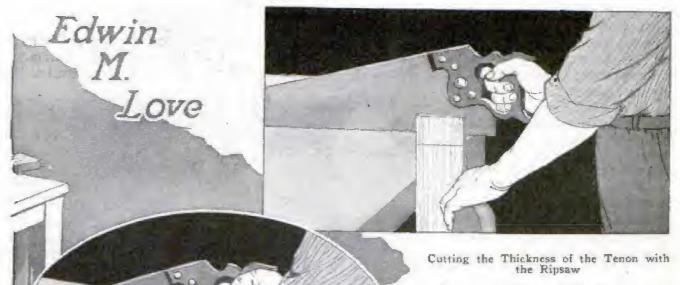
tending to neutralize one auother. Square up the stile stock in the same manner, locate the position of the mortise and mark its length.

Measure the

length of the rail to its shoulder, and with the point of a knife score a light line around the stock, squaring from face side and face edge. Here again, if the sides are taken in rotation, error is certain to result, and the lines will not meet at the last corner, especially if the square happens to be a little out of true.

Set a marking gauge for one-third the thickness of the stock, and guiding on the face side, gauge a line on both edges and end to the shoulder marks. With the same setting, mark one side of the mortise. Then set the gauge for two-thirds the thickness of the material, and repeat. The thickness of the tenon and width

Tenon, and Dado Joints



Above, Ripping the Tenon to Width, and at the Right, Sawing Off the Cheeks

of the mortise are now determined.

The wisdom of gauging both pieces from the face sides is apparent, since, if one is thicker than the other.

the good sides will come flush in the joining, and excess stock can be removed from the back. Moreover, the width of the tenon and the mortise would be dependent on the thickness of the material if gauged from both sides. Knowing the width of the tenon and its position on the rail, gauge both edges from the face edge. This completes the laying out.

Clamp the rail vertically in a vise and, with a backsaw or ripsaw, cut the cheeks or sides of the tenon, "splitting the line," that is, leaving half the line on the tenon, the kerf being in the waste wood. If there is any tendency for the saw to "run," or cut to one side, due to having longer or sharper teeth on one side than on the

other, cut alternately from one edge and then the other. If the mechanic is right-handed, the tenon is preferably to the left of the saw, so that the line is kept freely in sight; though, of course, when sawing alternately

from one edge to the other, the

tenon must sometimes be at the right. Rip the edges before cutting the shoulders, thereby retaining the guide lines. Crosscut the side shoulders and then the edges. The broad side faces are much more conspicuous than the edges, so that, if any undercutting

occurs, it should be on the edge rather than the face, where it might be were the edges cut first. It is easy to cut the thin edge stock away without marring the faces.

Narrow mortises are best hollowed out with a chisel. Use a full-width chisel, and start cutting a short distance inside of the end mark, since the wood crushes back behind the flat side of the chisel, and if the edge is placed on the line, the mortise will be too long. This is an important point where the end of one board is being housed into another, as there is then no projecting shoulder to hide the mortise edge. Make cuts across the grain every 1/4 in., striking the chisel handle with a

mallet, or if this is lacking, with the side of the hammer head, the carpenter's usual method. Having chipped to the end of the mortise, rake out the chips and repeat until the proper depth is reached. Avoid prying against the mortise end, as this bruises the corner.

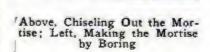
The tenon should always be a little shorter than the mortise depth, not only

to make sure that it will not interfere with the closing of the joint in assembly, but to provide room for excess glue, which, if unable to escape, would split the piece.

Wide mortises may be bored out with brace and bit and smoothed with a chisel, the work being supported on the bench or in the vise.

Before assembling the joint, coat both the cheeks of the tenon and the sides of the mortise with glue, for in no other way is it possible to be certain that the full gluing surface is utilized. The ends of the mortise and the tenon absorb glue so rapidly that, unless they are previously sized, they cannot be relied upon to contribute to the strength of the joint.

The common gained



or dado joint is especially useful in drawer construction, or for supporting shelves in cabinets. This is really a form of the housed joint, with the mortise lying across the grain, receiving the full thickness of the other piece.

In the common form, the groove is cut the full width of the material. Surface the stock and mark the face edge and side



Cutting the Edges of the Tenon with the Backsaw

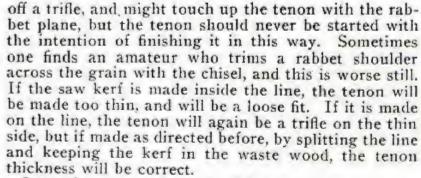
as before. Having located one side of the groove, use the end of the mating piece as a pattern for marking the width, or, if this is not practical, simply measure it. Gauge the depth, which should not exceed one-half the thickness of the stock, and cut both sides with a backsaw or fine-toothed finishing saw, keeping the kerf in the waste wood. If one is skillful with the saw, no guide other than the

thumb of the left hand is necessary; but the average amateur will find it convenient to tack a straight strip of wood along the line against which to hold the saw.

If the dado is wide, chisel a slope on each side in the waste wood before chipping out; otherwise, holding the chisel flat, cut out nearly to finished depth, and smooth the bottom to the line. Use the hand to force the chisel, or, if the wood is tough, use a mallet or the side of the hammer head.

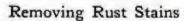
In assembling, if careful work has been done, the mating board should slide snugly in without loose-The use of a "dutchman," or ness or crushing wedge, is to be frowned at, and is permissible only for painted work. Since all parts of the joint present end grain on one side, this wood must be sized if the joint is to be glued.

Sometimes the piece dadoed in does not come flush with the other. In this case make a blind dado, which is the type shown in the illustrations, chiseling



In sawing across the grain, it is more than ever necessary that the saw cuts be made in the waste, as the recess formed between the saw cuts in making a halved joint will receive a piece of wood that is already the full

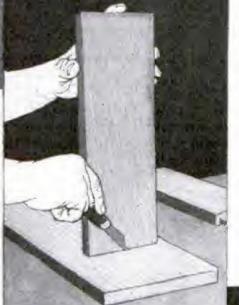
width of the stuff being used. In other words, the piece of wood that will go into the recess cannot be made wider to make up for any inaccuracy caused by careless sawing, whereas, should the tenon be cut a trifle narrower than intended, the mortise can be cut accordingly.



Rust stains on the family wash are a frequent source of irritation to the busy housewife, while in many textile plants they also cause a loss by producing "seconds," etc. The stains may be the result of a number of sometimes entirely unsuspected causes. Some water con-

tains enough iron in solution to produce a rust mark on white materials when it is used with a soap

Left, Guiding Saw with Strip in Cutting a Dado; Below, Chiseling the Waste Wood from Dado



Above, Trimming the Mortise after Boring; Right, Marking the Width of a Dado

out a mortise at the blind end, so that a stroke can be made with a saw in cutting the sides. The blind dado can also be used with good effect with a flush shelf by notching the

front edge of the latter to fill the space beyond the blind end.

The commonest fault of the amateur is that of trying to trim a tenon with a chisel. This is very bad practice. The tenon should al-

ways be cut to exact size with the saw, by "splitting the line," and experience seems to prove that if a man is so inexpert that he cannot do this he will only make matters worse by resorting to the chisel, which, in this case, is a more difficult tool to handle.

Moreover, the guide lines are gone when the cheeks are cut away. It is true that some books recommend cutting a little distance from the line and planing and chiseling to size, but most authorities frown on the practice, and a mechanic would never think of doing such a thing. Occasionally, of course, any man will run having an excessive amount of alkali. Other water is normally free of iron, but fungus growths containing iron may develop in the water mains, become dislodged with any increased flow of water, and thus carried into the consumer's premises. Again, the bluing used after washing may contain iron. This type of

bluing is entirely satisfactory provided the clothes are thoroughly rinsed, but if just a little too much soap or washing compound remains on them, the blue will develop a red iron mark. Frequently one may neglect wiping off a wire clothes line before hanging out the wash. There are many other causes of rust marks in the home, as, for instance, the various iron parts of washers, wringers, etc., but those given are probably the most common. In the ordinary household there is not usually enough difficulty of this kind to lead to much experiment on methods of removal, but in some factories it becomes an item of more interest:

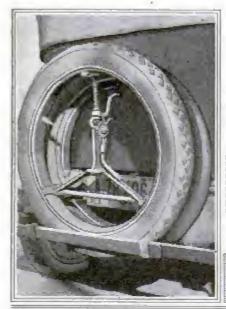
Recently the British cotton-industry research association conducted extensive

investigations along this line and found a method which they considered good enough to recommend. They suggest sponging the mark with a cloth pad saturated with a cold solution containing 1 oz. of oxalic acid and 1 oz. of acid potassium fluoride in 1 qt. of water, until the mark disappears. The excess of solution should then be washed out of the fabric with plenty of clean water, and finally the entire wet space should be dipped into dilute ammonia water to neutralize all traces of the chemicals used. When this treatment is used with care, the rust mark can be removed successfully and, according to the association's report, the most delicate white fabrics will not be injured.—Chas. E. Mullin, Camden, N. J.

Jack Makes Tire Carrier, Contractor and Expander

The accompanying photos show how an ordinary screw jack may be adapted to form a carrier for an extra tire on the car, making it possible to carry two tires instead of one. In addition, the jack may

round at one end and threaded to take nuts that bind them to the frame of the regular carrier. At the other end they are bent to form seats for the rim and the ends bent back to make pointed hooks. The supports are bolted to another flat-iron bracket which is riveted to the base of the jack, and strengthened by means of a pipe



Above, Extra Tire in Position; Center, Details of Construction

be used for contracting and expanding the rims, and as it is rigidly attached to the car, the work is greatly facilitated.

The jack is attached to the rear of the car, behind the regular spare-tire carrier, by means of flat-iron supports, made as shown in the center detail. The lower ones are forged





Above, Tire Removed: Left, Contracted Rim Ready for Casing

brace. The upper support is made of lighter iron bent around the neck of the jack and shaped so that it can be bolted to the upper bracket on the carrier. The handle of the jack is bent so that it lies against the bracket that is bolted to the jack base. To the swivel head of the jack another flat rim support, with

a hook similar to the lower ones, is riveted. When it is necessary to remove a casing from the rim, the hooks are engaged with the edge of the latter, and the screw of the jack is run down, causing the rim to contract. When a casing is to be put on a contracted rim, the latter is placed on the jack, the casing put in position, and the screw run up, thus expanding the rim and pressing it out against the casing. A few more turns of the screw then locks the rim firmly in place on the carrier. ratchet wheel of the jack may easily be locked to prevent the theft of either tire. -Mrs. Hassie Terrell Hixon, Auburn, Alabama.

Treating Stucco before Painting

Paint usually peels off stucco very soon, especially if the latter is new. To prevent this, the stucco should be coated with a solution consisting of 20 parts of sulphate of zinc and 80 parts of water. This will cut the caustic effect of the lime in the stucco. After this coat has dried, the paint is applied and it will then stick permanently.—L. H. Georger, Buffalo, N. Y.

Holding Furnace-Pipe Sections

Those who are unfortunate enough to have a long run of smoke pipe from the furnace to the chimney, probably have experienced trouble by sections pulling apart when assembling the pipe. writer solved this difficulty with a few cotter pins. Two sections were put together at a time. Two small holes were drilled opposite each other at the joint through both pipes. A cotter pin was spread wide apart and the ends then squeezed together with the fingers and inserted into the hole. Sections thus assembled will not part except by lifting out the cotters. By numbering each section and drawing a line across each joint with stovepipe enamel the sections can always be reassembled in exactly the same relation.—L. B. Robbins.



Stovepipe Sections Held Together Securely by Means of Small Cotter Pins

Saving the Grindstone

Grindstones become soft if left standing in water. To prevent this trouble, a small felt-covered wheel can be arranged to be partly submerged in the water, and



Small Felt-Covered Wooden Wheel Partly Immersed in Water Keeps the Grindstone Moist

at the same time the portion above the surface of the water should be kept in tight contact with the edge of the grindstone by means of a coil spring as shown.

Cleaning Rolled Seams on Tubs before Soldering

When galvanized-iron tubs and pails with a rolled seam at the bottom develop a leak at this point and the joint is heated for soldering, any moisture, soap or grease in the joint will run out and prevent the solder from sticking. To overcome this apply the flame from the outside and below, and heat the seam until it appears dry and stops smoking; then clean the surfaces about the seam on the inside. When the soldering now is done in the usual way, there will be no trouble. If the soldering torch is held on the outside of a thin sheet of galvanized iron, the inside surface will be burned black, but by applying the flame to the thick seam, this is less likely to occur.

I To prevent the absorption of moisture by the salt in salt-shakers during damp weather, place a glass over each shaker, when not in use.



Paris Carpenter Finds Use of Stilts More Practical Than Stepladder

Stilts to Take Place of Stepladder

For various kinds of work where stepladders are customarily used, a Paris carpenter finds stilts more practical, as they save the time lost in descending and ascending the stepladder every time its position is changed. The stilts are made so that the steps can be adjusted for height.

Measuring and Cutting Paper from Rolls

A handy cradle which facilitates measuring and cutting off paper from rolls is

shown in the photo. It is attached to the end of the counter or bench on the top of which a scale is marked The roll of off. paper is placed in the cradle and the end is pulled along the top of the counter until the proper length is un-Then the wound. paper is cut off by simply pulling a pair of shears along the edge of a sharp piece of metal extending across the end of the counter.—Charles W. Geiger, San Francisco, Calif.

How to Keep an Aquarium Successfully

"I never had much luck with my aquarium," is a statement you have often heard, but did you stop to consider that, may be, it wasn't so much poor luck as it was lack of knowledge? Fish, to thrive, need good treatment and good food as much as dogs, cats or birds. They breathe oxygen, which is found in the air, and exhale carbon dioxide. Plants, however, need carbon dioxide and give off oxygen. So, you see, that if there are enough fish and enough plants in an aquarium everything This is called a "balanced works well. aquarium." However, if there are too many fish or too many plants, there is too much of one kind of gas and not enough of the other, and one or the other of the living things in your aquarium begins to This is one of the biggest troubles of the aquarium keeper, but when you know the reason for it you have it cornered, as it is easily possible to increase or reduce the number of plants until you have a balanced aquarium and so keep all your fish alive.

Feeding fish is fortunately not difficult, but there are some important things to remember about it. Experiment to find out how much your fish readily eat, then give them just that much and at a certain time each day. Be regular about feeding them. Variety of food is one thing that makes healthy fish. Give them a change. Here are some kinds to try: cut-up grubs, scraped or shredded beef, and the manufactured forms, such as ant eggs, wafer food and ordinary crumb food. How often the water should be changed de-

pends on the size of the aquarium. A small bowl ought to be changed every week, a medium-size, every ten days or two weeks, and a large tank, well stocked with growing plants, only when the water is dirty or you wish to rearrange it. Make the aguarium comfortable for the fish; have a castle or some rock work



Cradle on End of Store Counter Facilitates Cutting Off Measured Lengths from Paper Rolls

and some sand or pebbles on the bottom. Seashells are not advisable for the freshwater aquarium, as they contain lime, which is injurious to the fish. Place the plants so that there is a stretch of clear water for swimming. Don't let the sun or very bright lights shine on the bowl, for this will heat the water, and warm water is uncomfortable for fish. Snails

are scavengers, which help keep the fish bowl clean, and it is therefore a good thing to have a

few in the aquarium.

Fish diseases are better left alone by amateurs, as their correct treatment is difficult. If you have healthy fish to begin with and treat them properly, you need have little fear of disease. However, for general poor condition, put the afflicted fish in a small basin of cold, salt water for a few minutes. It is advisable to do this during exceedingly hot weather also. If you have be-

come very interested in your aquarium, you may wish to have some other aquatic pets besides goldfish. A paradise fish or two make a suitable addition, as they are beautiful and graceful, or some of the wild game fish will also thrive. The latter, of course, cannot be placed with the goldfish on account of their warlike tendencies. You may expect your fish to live to a ripe old age if you treat them right, for fish do not die young naturally. In fact, there is in Japan a goldfish which is 19 years old.

—Donald Culver, Montclair, N. J.

Sealing Canned Meat

To prevent canned meat from rising above the fat or paraffin sealing. I cut a

number of strips of cedar 1/2 or 3/4 in. wide, a little longer than the diameter of the neck of the jar. These were pushed under the shoulder of the bottle as shown inthe drawing. The paraffin was then poured in. This arrangement keeps the meat down effectively.



When opening the can the stick is split and can then be removed easily.—Mrs. M. G. Alexander, Farran's Point, Can.

Snubbers for Ford Car Made at Home

After he had broken three front springs in one summer, an autoist looked around for a cheap means of preventing further breakage. The remedy he finally devised consisted in riveting snubbers, made from an old belt, around the front axle and the

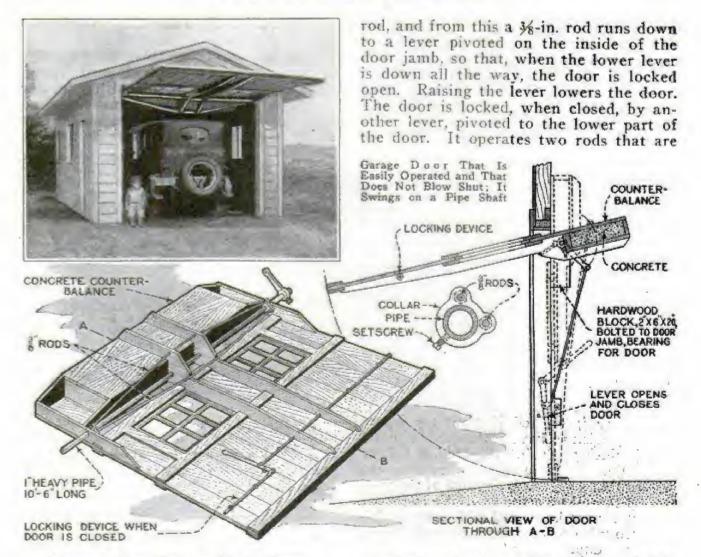
Old Belting Makes Good Snubbers for Light Cars and Prevents Breaking Springs

frame of the car. The belting was of four-ply canvas, 5 in. wide, and was cut in two, overlapping the splices 4 in. The photo shows the installation clearly.—Dale R. Van Horn, Walton, Nebr.

Putting Life into Moth Balls

Putting life into moth balls is an interesting experiment for anyone to carry out as it causes curiosity to all those who see it, and is also a good advertising stunt to draw attention to window displays. A druggist found that it brought over 30 persons into his store every day to make inquiries and 25 of these made a purchase. Take a fruit jar that can be made air-tight and has good clear walls. Fill this twothirds full of water and add equal quantities of potassium bicarbonate and citric acid until the solution is about 1 in, from the top. Then put four or five or more moth balls into the container and screw on the lid. The chemicals will begin to react and the balls will move upward and downward, sometimes two at a time and sometimes all of them, without apparent reason, and the glass wall magnifies the balls and makes them look like balls of cotton.-David J. Morris, Austin, Tex.

(Small drills are easily broken, but if a short piece of pencil, with the lead removed, is slipped over them, with only the proper length exposed, pressure can be applied without danger of breakage, as the pencil will prevent the drill from bending and consequently breaking.



Garage Door Swings Up to Open

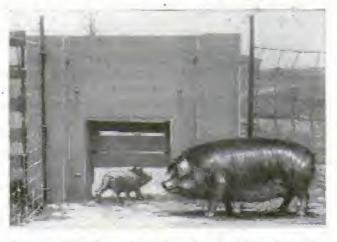
The unusual type of garage door shown herewith is made of 12/16-in. pine shiplap, except the 2 by 4-in. bracing. At the inside top is a counterweight, made by filling a box form, 8 by 22 by 66 in., with concrete, reinforced with wire. Just below the counterweight is a shaft, on which the door swings. This is 1-in. extra-heavy pipe, 10 ft. 6 in. long, and 2 by 6 by 20-in. hardwood blocks are bolted onto the door

jambs for bearings. A collar, with bosses drilled to take 3/8-in. iron rods, is fastened to each end of the shaft; 3/8-in. rods are threaded, passed through the holes in the collars and over and under the door braces and drawn up tight with nuts. On one end of the shaft is fastened an old auto connecting attached to the door with staples and slide into holes drilled in blocks bolted to the jambs as indicated.

Concrete Pig Creep Adjustable

To allow the smaller pigs to pass through but not the larger ones, an Indiana farmer made the concrete creep shown in the photo. Removable 1-in. boards, 8 to 10 in. wide, were used to reduce the size of the opening, which was otherwise large

> enough for the biggest hog to pass . through. Incidentally, the gate serves as the corner post for three fences. Large screweyes were inserted in the concrete while pouring it. Lengths of pipe, to which the fence is attached, are slipped through the screweyes.-J. C. Allen, West Lafayette, Indiana.



Concrete Pig Creep Is Adjustable to Allow Only the Small Ones to Pass through It

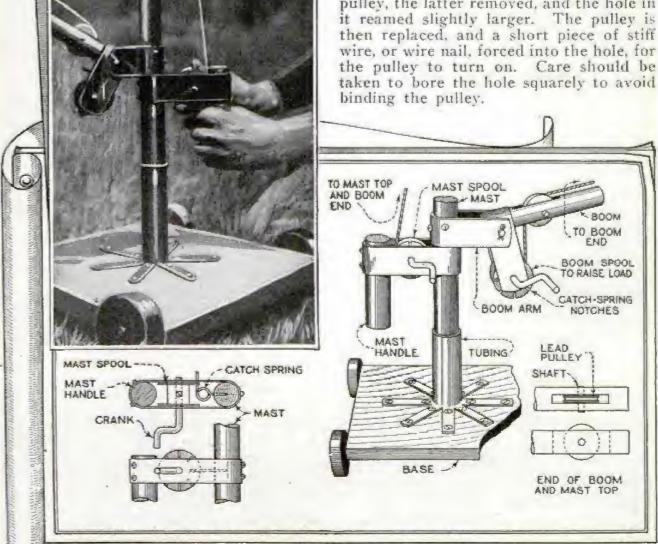
How to Make a Toy Derrick

By RICHARD C. TARR

A TOY derrick to amuse the growing boy may be constructed without much trouble and at little cost to the home workman, or by the boy himself, and will stand up under considerable rough usage.

A base, 12 in. square, is first constructed of %-in, pine, battened at the ends to prevent warping, and provided with four wheels, cut from the same material with a coping saw or jigsaw, bored, and attached with screws to the four corners of the The socket for the mast is of brass tubing slightly larger than the mast, and having one end slit eight times, lengthwise, about 4 in. in from one end. These slitting is done with a hacksaw. sections of the tubing are then spread out, drilled and screwed to the top of the base, keeping the tubing rigidly in an upright position. The socket of the derrick pictured was made from a discarded tire pump. The mast is constructed of a 1 by 36-in. dowel stick, the boom is 1/8 by 22 in. and the mast handle is 1 by 4 in., all being dowel stock, which can be obtained from any large hardware store, or a dealer in manual training supplies. A footplate should be screwed to the bottom if a hole is bored through the base to secure additional depth for the mast socket; however, this is not necessary if the mast is permitted to rest directly on the base.

The pulleys at the top of the mast and ends of the boom are of cast lead, grooved with a hacksaw around the edge, and smoothed with sandpaper. Oblong openings are cut, slightly larger than the pulleys, in both ends of the boom and in the top end of the mast, about ½ in. from the end of the mast and the outer end of the boom, and 1½ in. from the inner end of the boom. The pulleys are then wedged in place temporarily with cardboard in their respective openings. Holes, % in. in diameter, are bored through wood and pulley, the latter removed, and the hole in it reamed slightly larger. The pulley is then replaced, and a short piece of stiff wire, or wire nail, forced into the hole, for the pulley to turn on. Care should be taken to bore the hole squarely to avoid binding the pulley.



Close-Up View of the Derrick Base and Pulley Fittings, and Details of Construction of the Various Parts of the Toy

The arm securing the handle to the mast is 1/16 by 1 by 12 in., the boom arm, 1/16 by 1 by 6 in., and the spool bracket,

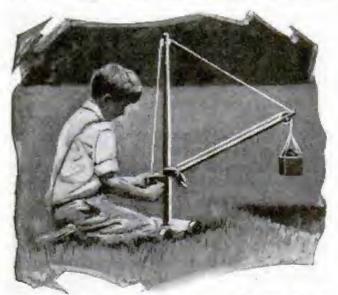


Photo of the Completed Toy Derrick in Use, with a Miniature Bucket at the End of the "Cable"

1/16 by 1 by 7 in., all sheet brass. The sketch shows their construction. notches for the catch springs are made by drilling a series of 1/10-in. holes in the sides of the spools in the places indicated, cutting smooth slits with a small chisel or broach and polishing with fine emery cloth. The catch springs, which hold the spools from turning when in use, and which are held back with one hand while operating the crank with the other, are rather tricky to place in the small holes bored into the mast and boom for them, but once placed will hold their position and work perfectly. The boom swings, within the boom arm, on a pivot made of a length of wire nail, drilled at the ends and held in place with small cotter pins or wire.

The construction of the spools can be readily understood from the sketches. Sheet brass, 1/16 in. thick, is used for the

sides, and a 34-in. length of dowel for the centers. Two 3½-in. lengths of wire serve as cranks, held in place by small brass screws driven into the spool centers, after the cranks are in place.

Lead weights placed on the outer edge of the base will prevent any tendency toward tipping when in use. The woodwork should be given one or two coats of white shellac, and may be stained, if desired, to any finish.

Windmill Exhaust Fan

Satisfactory results have been obtained with an exhaust fan made from an old

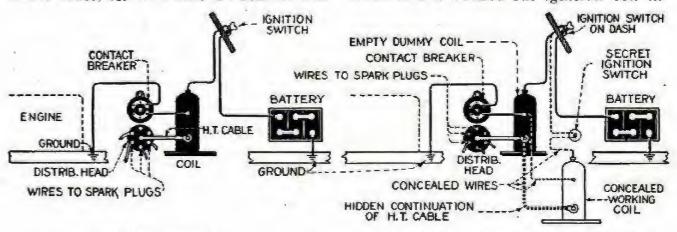
windmill. The arrangement is clearly shown in the accompanying photo. A circular hole, about 4 in, larger than the diameter of the windmill wheel, was cut in the wall, and the wheel was then carefully mounted with bearings on the inside and outside, and a 10-in. pulley was keyed to the inside end of the



shaft. This was belted to a small electric motor, so that the wheel made approximately 200 revolutions per minute. Obviously a large volume of air is displaced with this wheel in a short time.—Dale R. Van Horn, Walton, Nebr.

Preventing Auto Theft

Theft of his automobile, with snap-on wires and a burned-out ignition coil in-



FACTORY WIRING MODIFIED WIRING SCHEME USING DECOY COIL
Altering the Wiring System of an Auto and Substituting a Decoy Coil for the Regular Coil, Which Is Hidden,
Make Car Theft-Proof

dicating the means by which the machine was taken, recently led a motorist to devise a plan to prevent this from happening The scheme involved the use of two coils; a dead one, occupying its usual place on the dash and acting as a decoy. and a carefully concealed working coil, to furnish the actual ignition current.

The problem had its obvious difficulties. If the wires leading from the decoy coil to the circuit breaker, ground and dash switch were to remain intact so as to give the appearance of undisturbed regularity. then it seemed necessary to run wires between these places and the working coil. Naturally this would not do, as the sight of two sets of wires would give the scheme away to the practiced eye of the expert crook. The illustration shows, at the left, the standard, factory-wired ignition system of the car, the ammeter and other minor details having been omitted for the sake of simplicity. The theft-proof wiring is shown at the right, the additional wires being marked as dotted lines. All visible coil connections appear as made at the factory. The wire that runs from the top of the decoy coil to the dash switch is a blind wire; it has copper connectors at both ends, but they are so attached that no electrical contact is made. The wire connecting the circuit breaker to the dead coil is continued through the hollow dummy coil and passed through a hole in the dash to the corresponding terminal on the concealed working coil. tension cable connecting the dummy

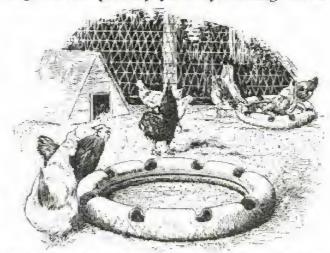
fastened to the high - tension terminal of the working coil. Lastly, a wire is run from the top of the operating coil to the dashboard switch and a second, secret switch serves as additional protection. While ignition coils differ in shape and in electrical hookup, the principle of this wiring scheme may be applied to practically any car. No

detour winding or bridging of the switch, not even the possession of the proper switch key, will be of the slightest help to the thief or unauthorized user as long as he remains

unaware of the second coil.

Poultry Watering Trough

Old auto casings may be used to advantage in the poultry yard by cutting holes



Using Old Auto Casings as Watering Troughs for Poultry

through one side of them, placing them flat on the ground and filling them with The holes are readily cut with a saw. Do not cut through the beads of the casing and cut only halfway down the tread, as shown in the drawing. The two beads of the casing lie close together, which keeps out most of the dirt.

"Swinging Darkey" Toy Amuses Children

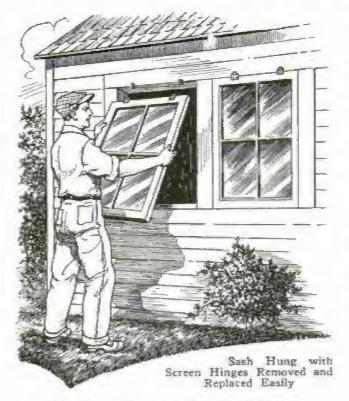
Although the principle of the toy shown in the illustration is not new, this adapta-

> tion is quite novel and will prove popular with the youngsters. It consists of a comic head cut from a magazine and glued to a piece of stiff cardboard. This is mounted on a small block of wood, a length of wire and a weight are attached to the block as indicated,

and wire pins are provided under it to serve as pivots. The wire holding the counterweight must be bent so that the head will stand upright when the device is set on the table. A fishline sinker may be used for a counter-A swinging moveweight. ment is imparted to the coun-

terweight and will cause a similar rocking of the head.





Hanging Sash on Poultry House

Sash on poultry houses should be hung so that they can be easily and quickly removed or replaced. A good method of doing this is to use screen or storm-sash hinges, as shown in the accompanying illustration. With these hinges the removal of sash is but a few moments' work. They may be taken down in the morning and replaced at night, or in case a storm comes up, with little trouble.—Rufus E. Deering, Clements, Kans.

New Use for Clothespin

Tubes of tooth paste or shaving cream usually find temporary resting places on the window sills or on shelves in the medicine cabinet and in either place they are often mashed. To put the tubes where



they can readily be seen, and on the theory of a "place for everything and everything in its place," it was found that clothespins make satisfactory tube The holders. old-fashioned type of wooden pins should be used for this purpose, care being taken to select straight-grained ones. The head is cut off and a hole drilled through the shank for a woodscrew. A coat of white paint, and a minute's work fastening the holders to the cabinet, or wall, complete the job.—Chester Lynndelle, Trenton, N. J.

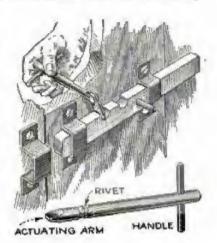
Hot-Water Bag Makes Portable Gas Can

An old hot-water bag will be found very useful to the motorist. It takes up little space under the seat or in a door pocket, and, in an emergency, can be used to carry sufficient gasoline to enable the driver to reach the nearest service station. It can also be used to carry water for the radiator, or for any other purpose for which a pail is usually carried.—Maynard Bodley, St. Paul, Minn.

Novel Door Latch

Resting on two flat-iron brackets, the door bolt shown in the drawing is actuated by means of a key that engages in notches cut in the top. A small round hole, about 1/4 in. in diameter, is the only

outside clue to the presence of the bar. The brackets are bent to the shape shown and screwed to the door. and a similar bracket is screwed to the door post to catch the bar when the door 1 5



locked. The key is made in two parts, cut from 11/4-in. stock. These are joined together with a rivet, one part being slotted to a depth of % in. and wide enough to fit freely over the shank formed by the other, the rivet being placed where it will permit freedom of movement. The key is pushed through the hole in the door; the end drops down engaging one of the notches in the bolt and, as the kev is turned, will drive it one way or the other to open or lock the door. The shank of the pivoted end should be rounded on top to permit withdrawal of the key. A stop pin is screwed into the bar to prevent it from coming out of the brackets.-John Mc-Neish, Boston, Mass.

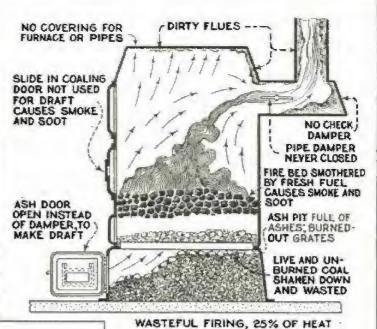
How to Burn Soft Coal

THE first rule in feeding the furnace with soft coal is never to cover the fire completely with fresh fuel. The fresh coal may be placed at the front or the rear of the firepot, at one side or the other, but should never cover more than two-thirds of the fire. A great deal of the heat contained in soft coal is in the form

heat contained in soft coal is in the form of combustible gases, and if these are allowed to pass off unconsumed much of the heat value of the coal is lost. It is just like turning on the gas in the stove and failing to apply a match, then

stove and failing to apply a match, then expecting the gas to heat a pot on the stove. By placing the

fresh coal in front, so that the gases must pass over the bed of live coals on their way to the chimney, but, as stated before, the fresh coal can be fed at the rear, or at either side of the furnace, depending on the design, and on the route the gases have to take to reach the smoke pipe. Another lesson may be learned from the



FURNACE AND PIPES WELL COVERED CHECK DAMPER 4 CLOSED DAMPER FOR PIPE DAMPER DRAFT OVER FRESH FUEL NEARLY CLOSED LIVE COALS FRESH FUEL PUSHED BACK FED IN GRATES PROTECTED BY COVERING OF CLINKER DOOR DAMPER FOR CLEAN ASH PIT DRAFT EFFICIENT FIRING.75% OF HEAT DELIVERED TO ROOMS

fresh coal over a part of the fire only, the live coals that are exposed in the other part of the fire act as a match to light the combustible gases, and the heat goes to warm the house instead of going up the chimney. The most convenient method of firing is usually to push the live coal to the back of the fire and feed the

gas stove. We know that a gas flame will not burn properly without

the correct amount of air, and that a flame that has insufficient air is not only a slow heater, but is also a smoky one. It is exactly the same with soft coal. The gases coming off the coal need to be mixed with air in order to burn and give up their heat, and the way to supply this air is to open the slide damper in the feed door so as to admit air above the The degree to which this slide is opened depends on the coal and the condition of the fire, and must be found by experiment. but, in general, it will be found

DELIVERED TO ROOMS

advisable to open it wide immediately after feeding the fire, and to shut it down partly or completely after the coal has become well ignited. Most soft coals need the air supply through the feed-door slide as long as they are black. When they are all red, of course, they no longer need the

additional air.

By paying attention to both of the foregoing rules, smoke and soot can be prevented to a large extent; soot cannot be entirely prevented, of course, and the flues and other heating surfaces should therefore be given regular attention, to keep them as clean as possible. Soot insulates the heating surfaces just like asbestos, and this wastes coal, so it pays to give these surfaces regular cleanings, just as often as it can be done.

Soft coal is more easily ignited than hard, so less draft is usually required. Too much draft wili make gas faster than the capacity of the combustion chamber to ignite it, and so waste fuel; so it pays to experiment with the draft, reducing it as much as possible without interfering with the proper burning of the fuel. At the same time, a strong draft is very necessary at times, when the fire has accidentally been allowed to become low, for example, and the house is cold, and the furnace should be capable of producing a strong draft when needed. All leaks around the furnace and smoke pipes, therefore, should be stopped.

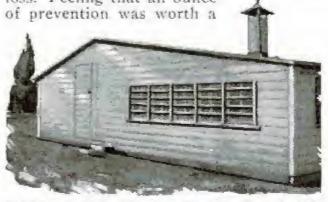
In order to obtain better control of the rate of burning of the coal, some ashes should be left on the grates. Try to operate the furnace with the ashpit damper closed and the feed-door damper open; if this will not work, open the ashpit damper just as little as will give the desired results. Don't shake the fire until it is absolutely necessary to brighten it, and stop shaking as soon as the first live coal drops through the grate. When cleaning the ashes from the sides of the firepot use the poker, or slice through the clinker door under the fire, not through the fire door.

Keep the firepot full of slowly burning fuel. This will produce more heat than a thin fire burning fast, and will require less attention. Arrange for some sort of water evaporation in the house, because moist air at 65° feels as warm as dry air at 75, and is more healthy. When using Pocahontas coal, moisten it slightly before firing, as this helps to coke the coal and produces better results. Don't bank a fire with ashes or stir up the fire bed so that ashes are turned over the unburned coal, as this will cause the ashes to melt and form clinkers.

Study the illustrations, and follow the hints contained in them.

Baffling Chicken Thieves

A Nebraska poultryman, who had one disastrous experience with chicken thieves, decided to prevent a recurrence of the loss. Feeling that an ounce



Old Pipe, Held in 2 by 4-in. Brackets, Protects This Poultry House against Thieves

pound of cure, in this case at least, he barred all the windows.

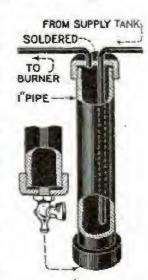
A quantity of ½-in. pipe was purchased very cheaply at a fire sale. This was cut and jointed to form a number of sections of the proper length, and spaced, 6 in. apart, over every window on the place. The photo shows a typical installation. Pieces of 2 by 4-in. stuff, bored for the pipe, are bolted between the sash and at the ends, the bolts running through the sides of the building.

The pipes can, of course, be cut with a hacksaw, but before thieves could cut through any considerable number of the bars, their presence would undoubtedly be known.—D. R. Van Horn, Walton, Nebraska.

Sediment Trap in Oil-Burning Supply Pipe

General adoption of oil burners for cook and heating stoves and furnaces brings up the problem of using cheap-grade oils without necessitating frequent cleaning of the burners. This may be accomplished

by the installation of a sediment chamber at some point along the pipe line between the supply tank and the burner. The chamber shown in the illustration consists of a length of 1-in. gas pipe with caps at both ends; the upper cap being drilled to receive the two ends of the cut supply pipe. which are inserted and soldered in place as shown. In operation,



oil flowing from the supply tank enters the chamber near the bottom and in rising to escape through the outlet it leaves water or solid sediment possibly present in the oil at the bottom. By shutting the supply valve at the tank and removing the cap at the bottom of the sediment chamber occasionally the accumulated water or dirt may be removed, or the draining may be done by fitting the bottom cap of the chamber with a petcock. This eliminates the need of a wrench to remove the cap and also the necessity of closing the supply valve each time.

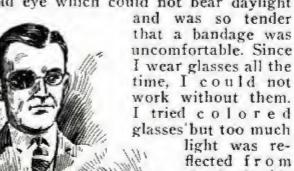
Preventing Rattle of Brake Rods

Hand-brake rods on Ford cars sometimes strike against the running-board supports and rattle every time the springs are compressed. This can be stopped by slipping a piece of loom, such as used as insulation by electricians, over the brake rod. The best plan is to use a length almost reaching from the rod support to the clevis at the rear end. The loom can then be turned around when worn in one spot.

—E. T. Gunderson, Jr., Humboldt, Iowa.

Homemade Paper Eye Shield

About a year ago I was troubled with a bad eye which could not bear daylight



flected from the back side of the lens. Necessity caused me to construct the eye shield shown in the

illustration. The material used is black paper, which can be obtained at any photosupply shop. A small wire eye is glued between two thicknesses of the paper and is slipped over the ear piece or side bar of the glasses and a slot is cut diametrically opposite the eye to fit the nose bar or bridge. A segment-shaped piece of the paper, pasted upright to the outer, or wire-eye, edge of the shield, prevents light from entering from that side.—Noble D. Gilkeson, Kansas City, Mo.

WIRE LOOP

Loosening the Engine-Cylinder Head

A cylinder head, put on after shellac has been applied to both sides of the gasket,

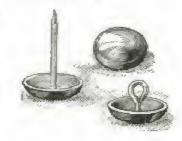


Removing Cylinder Head of Automobile Engine with Prybar Usually Saves Gasket

may be very difficult to remove, especially if the gasket must be used again. Driving a wedge under one edge is a practice which invariably destroys the gasket. Slacking off on the bolts and starting the engine is also most certain to blow the gasket, and the mechanic is often puzzled for a good method of removing the head with the least damage. In the illustration a prybar method of removal is shown. Simply provide an S-shaped hanger, one end of which can be passed through the spark-plug holes, while a bar engages the upper hook. The tightest cylinder head will come off readily, and the gasket can, in most cases, be used again.

Making Metal Buttons

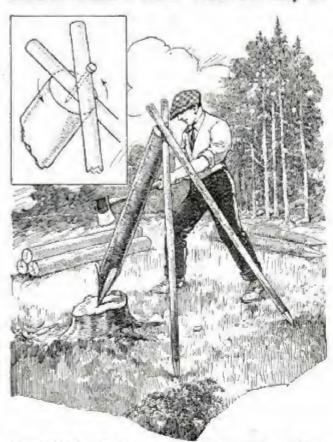
Serviceable metal buttons can readily be made from upholsterer's nails by bending the shanks to form eyes. This can be done by means of a pair



of round-nose pliers. Buttons of this kind are handy for various uses and will last indefinitely.—C. M. Wilcox, Torrington, Conn.

Sharpening Fence Posts

Sharpening fence posts usually requires one man to hold and turn the post while another wields the ax. This task may be



Novel Holder Facilitates Sharpening of Fence Posts

done by one man just as easily, if the simple holder shown in the illustration is used. It consists of two stout stakes hinged on a bolt, which projects 3 in. on one side and is sharpened to a needle point at that end. In use, the legs of the holder are opened and driven into the ground to support the device at a slight angle. The post to be sharpened is raised against the holder so that the bolt can be driven into the center. As one side of the post is cut down to the desired mark, it is turned on the bolt until the sharpening is completed.

Breaking In a New Pipe

No matter if it be a half-dollar or a tendollar one, new pipes have to be broken in and you know how bitter, woody and unpleasant the taste of a new pipe is until you have smoked it long enough to get it "crusted." Here is a simple way to break it in and also add to its sweetness right from the start. When the bowl is new, moisten the inside of it with a little water, and then fill the bowl with ordinary granulated sugar and immediately dump it out again. A thin film of sugar will ad-

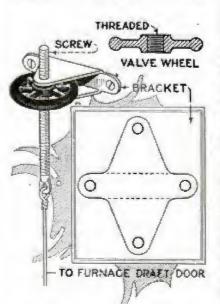
here to the inside of the moistened bowl; now, without knocking this film out, fill the pipe with tobacco and light up. That bitter, woody taste will be gone and the crust, which adds to the mellowness of the pipe, will form quickly. This process may have to be repeated several times.—Harry A. White, Davenport, Iowa.

Repairing Leaky Eaves Trough

It sometimes happens that a section of eaves trough rusts through in one place, while the rest of it is still in good condition. This can easily be repaired as follows: Cut a piece of canvas large enough to cover the hole, coat it with tar and press it down over the hole. Then coat the patch with tar on the inner side and let it dry. The trough should, of course, be well cleaned and dried before applying the patch.—W. O. Hendrickson, Argyle, Wisconsin.

Adjusting the Furnace Draft

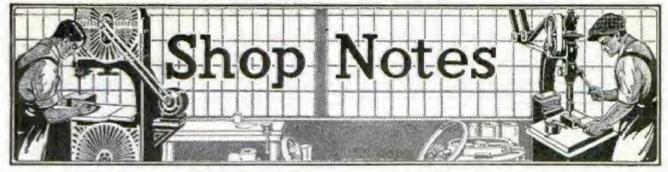
Where remote control is used for regulation of furnace drafts, it is usual that some form of notched segment, series of pins for a ring or other means for holding the weight at any desired place is used. An arrangement which allows closer adjustment of the draft is shown in the illustration. It consists of a metal bracket made to support a small globe-valve wheel. The wheel moves on a threaded



rod, which is in turn attached to the draft - door cable. The cable is led up from the furnace room to a convenient location, using pulleys to guide it if required. By turning the wheel the draft door can be raised or lowered by such small amounts that

a uniform temperature can be maintained more easily.—G. A. Luers, Washington, District of Columbia.

Plated brass and plated iron can be distinguished from each other by means of a magnet; the magnet will cling to iron.



All Shop Notes published in 1925, in book form-Fifty Cents-from our Book Department

Making a Convertible Toolpost Grinder

By RAY F. KUNS

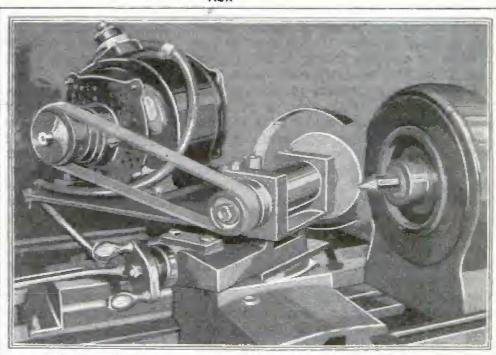
THE machine shown in the illustrations was designed to serve in a machine shop where a great variety of automobile and general machine-shop repair and construction work is conducted. Two years of daily service, in which time a number of grinder wheels have been worn out, would seem to prove that the design is good. The only expense or repairs needed in this time, outside of the wheels, has been the replacing of the belt.

In automobile work as well as in many other instances in our modern

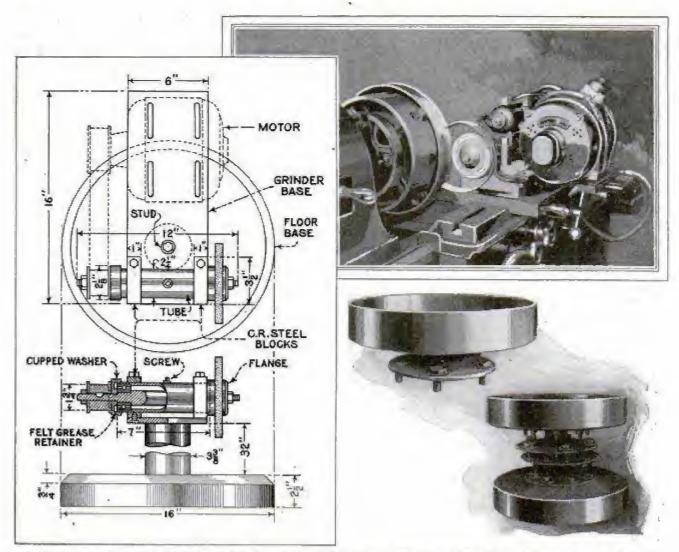
to such an extent that grinding is becoming almost indispensable, if the materials are to be machined. It is necessary to grind after heat-treating, if the work is to be true and free from the inequalities occasioned by the hardening and tempering process.

Accurate grinding work requires an accurate grinding head and a machine free from disturbing vibration. Of necessity the wheel must turn at high speed, and

bearings must be accurate and entirely free from play. For this reashops, heat-treated steel is used son ball bearings were given preference over plain bearings. Service has C.R. STEEL BEARING BLOCKS COLUMN Fig.I



Upper Left, the Grinder Mounted on the Column for General Grinding; Right, Used to Grind Lathe Centers



Left, General Details of Grinder and Column Assembly; Upper Right, Grinding Brake Drums; Lower Right, Some Reground Drums

proved the wisdom of the choice, since the bearings needed attention only once in a twelve-month period, and are still free of all play.

An essential to the use of ball or roller bearings in a grinder of this type is the exclusion of all grit which is floating in the air about the machine, and which, if it gains entrance, is certain to destroy the bearing quickly. With this in mind, it was decided to use a pipe or tube for the support of the ball-bearing races, and thus insure alinement of the bearings as well as exclusion of all dust from the inner sides. To prevent the dust from working into the bearings from the outer sides of the bearings they are protected by the cupped washers which come over the ends of the tube. Space is left, as shown, for a felt grease retainer which also acts as a dust excluder.

The size of the bearings is not indicated exactly, since it may be possible to adapt salvaged bearings to this service, as was done in the original machine. With the bearings at hand, the tube is selected to conform to them and machined to size on

out to receive the bearing races, which must be just a neat sliding fit. The shaft also must be designed to fit the bearings and the journal for the bearing cone must be just a snug sliding fit. A piece of a vanadium-steel axle was used for the original shaft. This is more difficult to machine, but is a most dependable material and one usually available without cost.

The bearing cones take the thrust of the cupped washers as they are forced on ahead of the grinder wheel on the one side and the pulley on the other. A flange of conventional pattern is made to hold the grinder wheel. The threads on the wheel end of the shaft are right-hand, while those on the pulley end are left-hand. It is a good plan to place a key in the pulley and shaft as an additional safeguard against turning.

As suggested by the title of this article, this machine is designed to serve double duty. When not in use on the lathe carriage, it is mounted on a column at one end of the lathe, where it is readily available as a tool-bit grinder and for other

light work. To facilitate this change a stud is made of such length that the upper end extends above the body of the grinder head. This stud is used to clamp the base of the grinder to the top of the column or to the lathe carriage. The base is made from 3% by 6-in. machine steel. The grinder head is supported in blocks of steel on the front end, and the other end is slotted to receive the motor.

The cold-rolled steel blocks that carry the tube are bored out to the size of the tube and slotted at the rear side. A screw is used to lock the tube into the blocks, after they have been assembled onto the base by means of two taper-head machine

The motor is ½ hp., and is fitted with a pulley to drive the head at 3,000 r.p.m. The slots in the base of the grinder are made to conform to the base of the motor. This arrangement allows ready adjustment of the belt used to drive the machine. A Ford fan belt was selected for this task, since it is readily obtained. The rubber-composition type is preferred to the leather belt because it is lighter and more flexible, and consequently less likely to set up vibration.

The column was made from a 3½-in. round machine-steel bar. The column base was machined from an old engine flywheel. The weight of these items helps to give rigidity when the grinder is used on the column. The base might have been made from 3-in, gas pipe mounted on a large brake drum and the entire column then turned over and filled with concrete to give it weight. When mounting the head on the lathe carriage, a nut to receive the stud is used.

The accompanying illustrations show some of the uses to which this little grinder has been put. Center grinding is always needed. Some brake drums may be

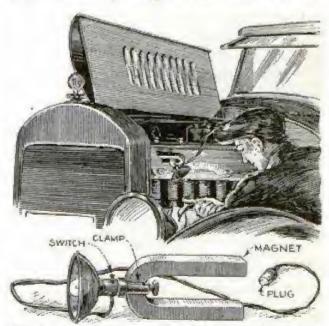
turned in the lathe and again they must be ground as indicated in this case. By mounting the rotating knives or cutter heads of lawn mowers in the lathe and supplying a rest for the blade, extremely accurate grinding may be done on them with this machine. It is likely, too, that the cutting bar can be ground with it.



Truck Body Divided into Three Parts Permits Even Distribution of Loads

Magnet Holds Trouble Lamp

When making repairs or adjustments on an auto engine at night, it is rather difficult to hold the lamp over the work properly. A handy lamp holder can be made



Trouble Lamp Held to Auto Engine by Magnet and Detail Showing Construction

from an old magneto magnet, which can be picked up at almost any junk shop. The magnet will adhere to any iron or steel surface, and by having the lamp adjustable, it can be swung around to any desired position.—Edwin E. Burgess, Jr., Baltimore. Md.

Homemade Dump Truck Distributes Load Evenly

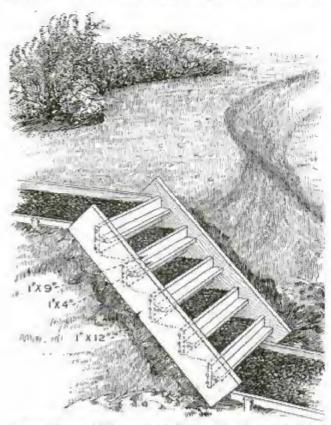
Where long stretches of highway are to be graveled at one time, a truck with a dump body having three divisions, each holding one third of a yard as shown, has been found a time and money saver. Com-

mon one-ton truck chassis are used. The body is bound with flat iron and has three compartments, each of which has a hinged door at the rear. The doors are of simple construction, each being provided with a knife lock, which permits dumping a load in three different places. This insures even distribution of gravel,

Male Ob Van Horn

Time-Saving Forms for Concrete Steps

When making forms for concrete steps, it takes much time to notch the stringers and nail on the tread strips. This work



Convenient and Timesaving Forms for Concrete Steps Are Easily Made

can be eliminated by using the type of form shown in the illustration. As is evident, no diagonal cutting of lumber is necessary. The sides consist of 1 by 12in. stringers, and 1 by 9-in. material is used for the risers. These pieces are cut to equal lengths so that they require only spacing and nailing. Lengths of 1 by 4in, stock are used to brace the risers. After the concrete has been poured and troweled, a piece of roofing or sheathing paper is tacked over the whole incline. This will carry off rain and prevent the steps from being used until the concrete is sufficiently hard .- G. A. Luers, Washington, D. C.

To Save Honey Bees

According to the claims of experienced bee keepers, grass or weeds, growing in front of hive entrances, causes a heavy loss of bees during the honey season. The bees returning to the hive overloaded with honey or pollen frequently fall before the entrance and, alighting in the thick grass, become chilled before they can crawl or fly into the hive. To prevent this one bee keeper has placed pieces of tar paper

or discarded linoleum upon the ground in front of the hives. These keep down and prevent the growth of grass or weeds and the bees settling upon them are exposed to the warmth of the sun where no obstruction is offered to hinder their flight into the hive after they have rested.—G. E. Hendrickson, Argyle, Wis.

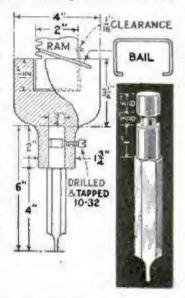
Small Bottle Useful to Motorist

A bottle small enough to be let down into the gasoline tank with a piece of string tied around the neck is very handy to carry in the auto tool chest when out driving. Should a tube have to be patched, gasoline is recommended as a cleaner for the part of the tube to be repaired. Also, if a spark plug needs cleaning, gasoline is used to do a good job. Greasy hands can also be cleaned very easily with gasoline, and the small bottle provides an easy method of getting it out of the tank.— S. N. Swenson, Harris, Minn.

Screwdriver for the Arbor Press

In removing large screws, especially those of the flat-head type, the main difficulty is keeping the bit of the screwdriver in the slot, and the workman resorts to the use of a hammer and punch. This,

of course, produces a very unworkmanlike job. However, the illustration shows a screwdriver that will take any size of screw on account of the detachable bit, and the fact that it is secured to the ram by a bail arrangement allows very fast use. the screwdriver following the up and down movement of the ram.

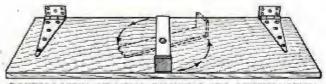


A wrench is put on the hexagonal section of the driver which turns in the fitting, the 10-32 screw simply holding the bit from dropping out. For use in removing the pole-shoe screws on motors and generator frames, a short piece of pipe can be put through the frame to keep it from turning, and the frame itself can be placed on a V-block made by sawing two triangular pieces out of a 12-in. section of channel iron. The body should be turned out of steel, allowing a clearance of 1/16 in. be-

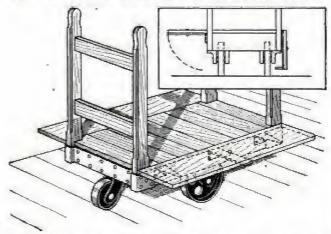
tween it and the ram. The bits, which were of different sizes to fit various screw slots, were made from old chisels that had their temper drawn, and were chucked in a lathe and a 2-in. section turned down and also slotted. The end of the bit was ground to fit the screw slot, leaving a part of the hexagonal for putting on a wrench. When removing or replacing screws the press-operating arm is used to keep the bit in a screw slot. The bail, made of No. 18 gauge steel wire, fits through the rack of the ram and into two holes in the side of the body of the fitting.

Collapsible Sides for Shop Truck

Fitted to a shop truck the folding sides shown in the illustration serve a double purpose: First, they prevent the load from scattering and second, they provide a gauge to limit the width of the load. When extended, the width should be such that the loaded truck will pass through any doorway in the building. Obviously, if the loading is restricted to this width there will be no danger of the load jamming or need of removing and rearranging it before it will go through. On the other hand, a truck nearly as wide as the doorways is not always convenient for other purposes, so the auxiliary sides are attached to the truck with hinges so that they can be folded down. In the center a strip of metal is pivoted, one on each side. These strips are bent at right angles at one end. When the sides are in use the strip is turned so that the bent portion rests against the truck; when letting them down it is reversed.



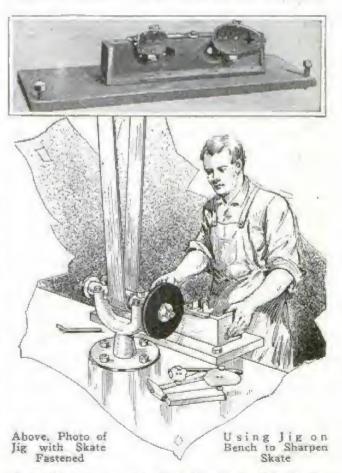
BOTTOM VIEW OF WING SHOWING ITS CONSTRUCTION



Collapsible Sides on Shop Truck Serve as Gauge to Measure Width of Doors

Skate-Sharpening Jig

While large machine shops usually have a regular supply of jigs for holding all the various models of ice skates for sharpen-



ing, the small shop has to work along with a makeshift or a quickly assembled jig. The jig shown herewith was designed by the owner of a small shop and will take skates of all sizes and types, enabling him to do a first-class sharpening job. base consists of a heavy steel plate, 30 in. long, with a bolt at each end to act either as supports or to permit fastening permanently to the bench. The jig itself is a piece of angle steel somewhat longer than the largest-size skate. The vertical side rises 4 in. above the base and is drilled and tapped with holes, all along the edge, at about 1-in. intervals. One vertical end is drilled and tapped in the same way and a few holes are tapped in the vertical side. A skate is arranged as shown and clamped in position, with bolts and washers over the blade at the most convenient points. The jig is placed on the base, which has previously been adjusted in front of an emery wheel. By pushing the blade against the wheel and moving the jig to right and left the entire blade is ground evenly. The size of the wheel determines whether the blade will be flat or hollow-ground.—L. B. Robbins, Harwich, Mass,

514 POPULAR MECHANICS

Simple Safety Attachment

for Hoisting Barrels

Barrels are hojeted without risk of dropping them with the simple attachment



Simple Safety Sling for Hoisting Barrels Prevents Accidental Dropping of Burden

shown in the photos. It consists of a flatiron ring large enough to fit over the head of the barrel, and heavy chains, which are slipped over the side and hooked securely around it near the lower head, so that the barrel cannot get loose.—R. G. Thackwell, Chicago, Ill.

Small Dams Prevent Creek-Bank Erosion

The erosion of creek banks and the resulting lowering of the water level which occur during flood periods, are especially undesirable in municipalities because the sewer outlets are uncovered with undesirable results. It can be prevented by building small concrete dams along the streams as shown in the photo. The dams are placed from ½ to ¼ mile apart, depending on the slope of the stream, and are built just high enough to keep the bottom of the channel covered with water from bank to bank, during periods of extremely low flow. Concrete aprons, several feet wide, are built on the downstream sides to prevent damage from undermining.— Ivan E. Houk, Denver, Colo.

Proper Use of Pine Siding

Be sure all siding is thoroughly dry before installation. Do not put siding on walls immediately after a rainstorm, but let the sheathing and framework dry thoroughly first. To fail in this may mean loose nails, open joints or buckling of portions of the siding. The proper lap for bevel siding is as follows: 34 in. on 4 in.; 1 in. on 5 and 6 in.; 1½ in. on wider stuff.

Siding should be cut with a miter saw at all corners. Wherever two pieces of siding join, it is best to use a splice joint. This is accomplished with a miter saw. Joints should be broken with as wide a space as convenient between the joints of overlapping tiers. Where siding butts up against window casings, a square, tight joint should be made. A metal flashing underneath the siding will prevent any possibility of water seeping in. For the finest finish and best work, nails in bevel siding should be countersunk and the depression filled with putty.

Before painting drop or bevel siding containing knots, a coat of thin white shellac should be applied. Siding should be given a priming coat as soon as it is laid, and for widths of bevel siding over



Small Concrete Dams High Enough to Keep Creek Bed Covered with Water Are Placed at Intervals of One Eighth to One-Fourth of a Mile to Prevent Erosion of Banks

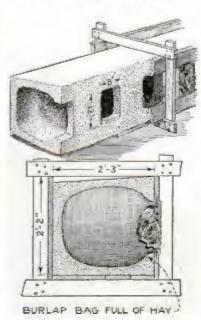
8 in., it is advisable to paint the back side before it is put on. After the priming coat, it is well to let the building stand a few days, or as long as convenient, before putting on the finishing coats. This will insure that shrinking will have taken place, and that all surfaces will be properly covered.

There are always areas on the wall of a house where lengths of siding down to 18 in. must be used. Do not demand all long siding from your dealer. Considerable amounts of short siding develop in the process of manufacture and must be disposed of. If the mill man could not get rid of these short pieces, it would be necessary to charge more for the longer ones. Short lengths can also be used to advantage on the porch, on the garage and various outbuildings. At times, an excess of these shorts will accumulate and is sold at reduced prices. If you are in a position to use all short pieces, your dealer may be able to quote a very attractive price on such material.

Durable Nests for Poultry Made of Concrete

A simple and inexpensive method of forming the inside of a concrete hens' nest is shown in the illustration. The form is made of burlap, which is sewed in such a manner that it will have the juglike shape indicated. After the burlap form has been sewed, stuff it with rags, excelsior or similar material. Ordinary wooden boxes are used for the outside form. After the bottom of the box has been cov-

ered with concrete about 3 in. in thickness, the burlap mold is put in place and concrete is poured all around it. As soon as the concrete has set sufficiently to hold its own weight, remove the packing little by little. It is almost impossible to use wooden molds for this



purpose as they cannot be readily removed and will swell after the concrete is poured. —H. H. Siegele, Emporia, Kans.



Easily Made Tile Hook Facilitates Laying Drain Tile in Deep Ditches

Tile Hook for Deep Trenches

A tool known as a tile hook is valuable for laying tile in deep ditches. The hook consists of a strip of iron, 1 in. wide and 12 in. long, bent so that a 4-in. portion may be attached at right angles to a handle. With this tool the operator stands above the trench and puts the tiles in the correct position.—C. M. Baker, Wooster, Ohio.

Never-Slip Gauge Aids Glazier in Cutting Glass

In cutting glass for doors and windows, many glaziers employ a yardstick, or ruler, as a gauge along which to move the cutter. Unless firmly held, such a gauge is likely to move, causing more or less damage and expense. To prevent this, one need only obtain a discarded inner tube and from it cut a strip of rubber of the same length and width as the ruler. With this strip cemented firmly onto one side of the gauge, it will not slip and the worker consequently will be relieved of much strain on the hands or fingers.

Labor-Saving Snow Shovel

To clear the sidewalk after a sudden heavy snowfall, a janitor lashed a double thickness of corrugated paper board to the



Baggage Truck and Piece of Corrugated Cardboard Make Handy Snow Shovel

front of a small, two-wheeled baggage truck. The sharp steel nose of the truck slid under the snow as easily as under a trunk or box and scraped the sidewalk clean, while the corrugated board widened the sweep and carried big heaps of snow to the curb. In a very short time the broad sidewalk was ready for traffic, and the inventor found time to chuckle at his neighbors, who were still sweating over their shovels.— E. L. Bowman, Evansville, Ind.

Suggestions on Sash Installation

Sash should be well painted before, or immediately after installation. Dipping in linseed oil before the glass is applied gives a coating that will protect all points against the absorption of moisture. A good priming coat of thin paint should be applied as soon as the sash is in place. The tops and bottoms of the sash should be most carefully painted.

Good service demands that sash be back-puttied, that is, a small amount of putty be placed in the sash before the glass is laid in it, thereby forming an airtight and water-tight cushion for the glass. On the outside of the sash, a mixture of pure linseed oil, white lead and

whiting will give best puttying results. Proper balance and fitting are essential. Weights that are too light or too heavy are often the cause of broken glass. Windows that are fitted too tightly or too loosely are sure to develop annoyances that cause repair expense or replacement.

In cold climates storm sash are generally approved and their use in winter assures comfort and coal saving. Window sash last longer by thus protecting them against melting snow and driving rains.

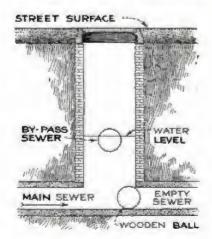
Sagebrush Mats Protect Canal Banks

In the arid western states erosion of irrigation-canal banks, due to high velocities of flow, can be prevented by lining the banks with sagebrush mats. Bundles of the brush are laid along the banks, covered with woven wire mesh and fastened securely at short intervals, either by piling large rocks on top of the wire, or by fastening the wire to posts set in the canal bed. The repairs are made during the winter and spring months when no water is carried in the canals.

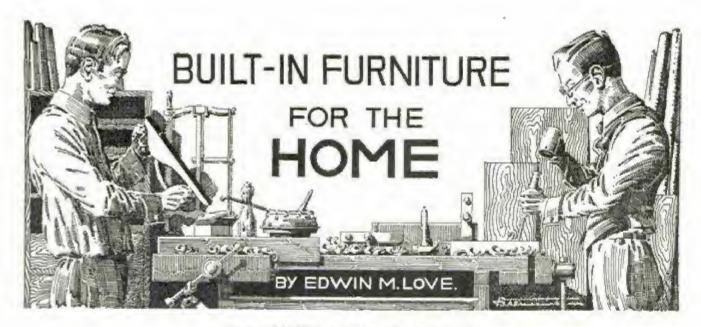
Wooden Balls Plug Conduits

Wooden balls can be used to stop the flow in sewers, blow-off pipes through dams, or other conduits where valves have not been installed. The balls are made slightly larger than the conduits and are

lowered in front of the openings where the suction of the moving water catches them and pulls them into place, after which they are held securely by the water pressure, which tends to push



them into the holes. The ball is dropped through the manhole and will take the position indicated in the drawing. In plugging a pipe through a dam, where the water is often several feet above the opening, the ball is built around a concrete core so that it will sink. Canvas wrapped around the ball helps to seal the small irregularities in the edges of the opening. Such a method was recently used at an irrigation dam where the water was approximately 200 feet above the pipe.



Part XVI -A Breakfast Nook

FROM many view points a breakfast nook is desirable. Being located in the kitchen, it reduces to a minimum the number of steps required in the preparation of a meal, saving both time and energy for all concerned. It enables the housewife to postpone clearing up the breakfast table, if need be, without exposing it to the scrutiny of early callers, and in addition, if it is well designed, adds to the beauty of the kitchen.

The nook illustrated calls for a recess 3 ft. 6 in. deep and 5 ft. 4½ in., from plaster to plaster, in width, though the design can be adapted to slightly smaller spaces. Glue up the table top from white-pine stock, 1¼ by 6 in., cut a little more than 4 ft. in length to allow for trimming, doweling every 10 in. and laying the heart side alternately up and down, so that warping will be reduced to a minimum. Also glue up stock for the two seat ends, uniting a

piece of 11/4 by 10 in, by 3 ft. with one 1 ft. 9 in. long for each, as shown in the layout. The table legs are of 11/4 by 10-in. and 11/4 by 8-in. material, cut long enough for a finished length of 2 ft. 5 in. Surface all this stock before laying out, but keep as thick as the material will allow. Smooth the top by planing

diagonally with a jointer and finishing with the grain. Test for wind (twist) by laying narrow straightedges on each end and sighting over them.

Divide the face side of one seat-end blank into 2-in. squares and lay out the outline of the ends as shown in the perspective. If a bandsaw is available, it can be quickly cut out; but sawing by hand is not especially difficult. Use handsaws and compass saw or a turning saw, and smooth up with spokeshave, wood rasp and sandpaper. One completed end can be used as a template for outlining the other.

Glue up the seat fronts, using 1 by 12-in. stock, cut 4 ft. long. Measure out from the plaster of a side wall 16 in. and up from the floor 1 ft. 6 in., locating the point on the plaster of the end wall. Level to the corner and locate a point ½ in. below it. This gives the backward slope of the

Details of Cabinet for Breakfast Nook and

Section through It

top or seat frame. The slope of the front board is obtained by measuring out from the plaster on the floor 1 ft. 1 in. and connecting with a point on the seat line 1 ft. 3 in. from the side wall. If a stud is found that gives secure nailing, nail up a cleat of 1 by 2-in, stock to carry the seat end, allowing

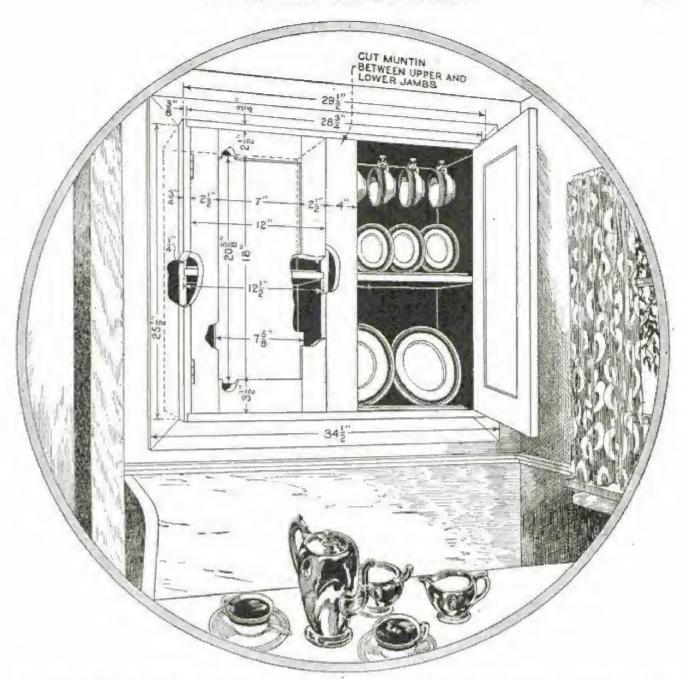


34 in. for the thickness of the seat, and also a cleat for backing the end of the front. Otherwise cut a solid backing to the correct shape, using glued-up 1-in. stock, and nail in place.

Scribe the back edge of the seat end to the plaster, tack in place, and lay off for cleats on the inside face to correspond to cleats on the end wall, by leveling across and measuring from the back wall. Nail, but do not glue, the cleats, as gluing will cause the end to check when shrinkage occurs. Nail a back-wall cleat of 1 by 2-in. stock to support the back edge of the seat frame. Build the frame of 1 by 3-in. stock, sized to a width of 2½ in. as shown in the drawing. Lay it on its cleats and scribe the end and back to the walls, giving it a length of 3 ft. 4 in.

Nail a floor cleat with the front edge flush with the front-end cleats. Scribe the front board to the end wall and cut it to the same length as the top frame. If it is a little narrow, glue and nail a strip to the upper edge. Nail to the wall and floor cleats, lay the seat frame in place and set up the seat end, toenailing it to the floor and nailing the front and frame to its cleats.

Shape a stop cleat of 2 by 3-in. stock, to fit under the front stile of the seat frame, as shown in the section, and make a lid of 1 by 12-in. stock. A cleat of 1 by 2-in. pine, 2 in. from each end on the underside, prevents warping. Hinge the lid with two nickelplated butterfly hinges, and near the front edge mortise in a flush ring lift. If there is any doubt as to the ability of the lid to carry the weight of persons sitting on it, glue and nail a projecting strip of 1 by 2-in. stock under each frame rail to act as stops. Build the other seat in the same way. Finish the table top to a width of 2 ft. 2 in. and a length of 4



ft., rounding the corners to a radius of 1 in. and sandpapering off the corners of the edges. On the underside, nail two cleats of 1 by 2-in. stock, 12 in. long, set back from the ends 8 in. and centered on the width, for backing for the tops of

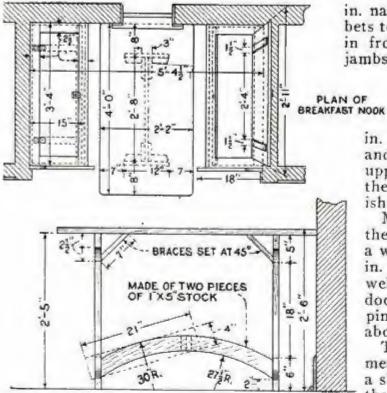
the legs.

Lay out the legs from a center line as follows: Five inches to right and left for a distance of $2\frac{1}{2}$ in. from the top end, which has been previously squared with the center line, curve inward to a radius of $2\frac{1}{2}$ in, for a distance down of $2\frac{1}{2}$ in.; taper outward for a distance of 1 ft. $6\frac{1}{2}$ in. from this point to a width of $5\frac{1}{4}$ in. from the center; curving outward to a $2\frac{1}{2}$ in. radius for $2\frac{1}{2}$ in., and finishing 8 in. from the center at a point 2 in. from the bottom end. The finished length of a leg is 2 ft. 5 in.

Lay out the stretcher according to the drawing, using two lengths of 1 by 5-in.

stock, and curving them to radii of 2 ft. 6 in. and 2 ft. 3½ in. Make each segment 1 ft. 9 in. long, and cut a ¾-in. tongue, 2 in. long, on one piece to fit into a corresponding slot centered in the thickness of the other segment. Fit carefully, and glue together. When dry, cut tenons, ½ in. thick and 2¼ in. wide, to fit into mortises cut in the legs, as shown in the elevations. Be sure to keep these in a line with each other, rather than following the curve.

To attach the legs, lay the top upside down on a pad on the floor, and after applying glue to the mortises and tenons, assemble them and toenail the leg tops into the cleats and table top with sixpenny finish nails. Square with the top, cut two braces of 1 by 3-in. stock, 7 in. long, miter on both ends, and nail to the legs and top. Sandpaper thoroughly, rounding the corners slightly. A handy accessory for the breakfast nook is the



wall cabinet built to fit between three studs. It provides space for several cups, glasses, saucers and plates. Each of the two compartments has a space, 1 ft. wide, 2 ft. high and 53/4 in. in depth, behind the door.

Make the upper and lower side jambs of 1 by 7-in. stock. Cut the upper and lower jambs to a length of 2 ft. 434 in. and notch the back edges to a depth of 41/2 in. for fitting around the center stud. side jambs are 2 ft. 11/2 in. long, with the ends rabbeted 38 in. deep to receive the ends of the top and bottom jambs. In the center of each is cut a dado, 34 in. wide and 1/4 in. deep, extending 53/4 in. from the back edge. The center jambs are 34

in. narrower and notched out at the rabbets to fit over the upper and lower jambs in front of the notches. Assemble the jambs, brace the frame square by means

of a diagonal strip of wood tacked across the face, and cover the back with two rectangles of threeply 3/8-in. panel veneer, cut 131/2

in. by 2 ft. 11/2 in. Remove the brace and fit the muntin casing between the upper and lower jambs, nailing it to the center jambs with six-penny fin-

Make the stiles and upper rails of the doors of 1 by 3-in, stock, sized to a width of 21/2 in., with lower rails 31/2 in. wide. Be careful to select straight, well-seasoned wood for such light doors. Hang with 21/2 by 21/2-in. loosepin butts, allowing them to project about 1/2 in.

To cut the opening for the cabinet, measure up on the wall 6 ft. 10 in., level a short line and locate a stud. Locate the two studs between which the cab-

inet is to be placed, and remove plaster and lath for a distance of 2 ft. 21/2 in. from the upper line. Slip the cabinet over the center stud, level it with the inside of the upper jamb, 6 ft. 81/2 in. above the floor, and wedge solidly, nailing through the end jambs into the side studs with eightpenny finish nails. Miter the 1 by 3-in. casing around the outside, fitting each piece to its side before cutting the miters. Near the front edge of the upper and lower shelves tack light strips of wood as stops for the dishes that are stood against the back of the cabinet.

White enamel may be baked on galvanized iron at a heat of about 180° F.

MATERIAL LIST

Seats and Table

- 1 piece, 11/4 by 10 in. hy 16 ft., white pine, S4S, sanded.
- piece, 1¼ by 8 in. by 4 ft., white pine, S4S, sanded.
- I piece, 11/4 by 6 in. by 12 ft., white pine, S4S, sanded.
- piece, 11/4 by 6 in. by 8 ft., white pine, S4S.
- sanded. piece, 1 by 2 in. by 16 ft., pine or fir. S4S. sanded.
- piece, 1 by 2 in. by 8 ft., pine or fir, S4S, sanded, piece, 1 by 3 in. by 16 ft., pine or fir, S4S, 1 piece, sanded.
- piece, 1 by 5 in. by 4 ft., pine or fir, S4S, sanded, pieces, 1 by 6 in. by 10 ft., pine or fir, S4S, 2 pieces, sanded.
- 1 piece, 1 by 7 in. by 14 ft., pine or fir, S4S, sanded.
 1 piece, 1 by 12 in. by 16 ft., pine or fir, S4S, sanded.
 1 piece, 2 by 3 in. by 8 ft., pine or fir, S4S, sanded.
 1 piece, ½ by ½ in. by 12 ft., baseshoe.

- 1 piece, 56 by 6 in. by 8 it., pine or fir, S4S, sand-ed, baseboard.
- pair nickelplated butterfly hinges.
- 2 nickel flush ring lifts. Cost of materials, about \$12. Time to build, about 25 hours.

Cabinet

- 1 piece, 1 by 3 in, by 12 ft., pine or fir, \$4\$, sanded.
- I by 3 in. by 10 ft., pine or fir, S4S,
- piece, 1 by 6 in. by 10 ft., pine or fir, S4S, sanded.
- 1 by 7 in. by 10 ft., pine or fir, S4S, 1 piece. sanded.
- piece, 3/8 in. by I ft. 4 in. by 5 ft., three ply pine or fir panel vencer, pair 2½ by 2½ in, loose-pin butts.
- 2 forg catches. 2 1% in. glass drawer pulls. Cost of materials about \$3. Time to build, 8 hours.

Steam Cleaning a Stone Building

Cement Banking Saves Coal

To meet the changing demand of present-day commercial conditions many old buildings are being altered or remodeled.

In order to eliminate the undesirable contrast always present in such cases between the old dirty surfaces and the new stone put in the walls, some kind of cleaning of the old portions is generally carried out. Because of the detrimental effects of acid cleaning or sandblasting, scrubbing with soap powders and hand brushes is customarily employed. method is effective, but slow and laborious, and in an effort to devise a faster and more efficient means of cleaning limestone, ex-periments with the use of live steam have been conducted at the bureau of standards.

... Soulet

An interesting demonstration of this experimental work was the

steam cleaning of the remodeled building of the Baltimore Commercial Bank, Baltimore, Md., where the scheme was given a practical trial under commercial conditions. The use of live steam at 80-lb. pressure, blown directly against the stone through simple nozzles made of galvanized pipe fitted to the end of ½-in. steam-hose lines, was found to be very effective in removing the 20-year accumulation of dirt on this Indiana-limestone

building. The cost of the job was somewhat higher than a bid received for acid This incleaning. creased cost is to be explained in part by the experimental character of the work, this being the first complete building ever cleaned with steam. The final color of the stone was not so bright as that of new stone work, but was considered entirely satisfactory, since it combined cleanliness with the appearance of age, which is usually thought desirable in stone buildings. The success of this

practical test leads to the conclusion that steam cleaning would, in most cases, be an economical and effective method. An eastern coal dealer, having a location below the sidetrack, laid a cement floor over the ground and a section of the



Inclined Bank Faced with Concrete Brings Coal from Cars into the Yard by Gravity

banking up to the track, on which the coal is thrown from the cars. The smooth surface of the concrete brings the coal down to ground level without rehandling, which greatly assists shoveling and prevents considerable waste.

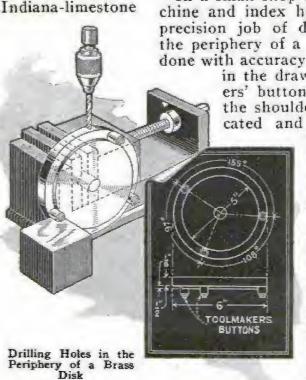
Drilling Holes in Edge of Disk

In a small shop having no milling machine and index head, the writer had a precision job of drilling three holes in the periphery of a brass disk, which was done with accuracy by the method shown

> in the drawing. Three toolmakers' buttons were placed around the shoulder of the disk as indicated and after being set the

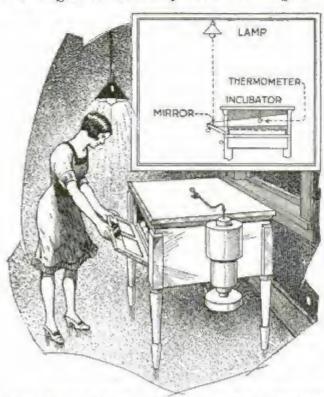
proper distance apart the mandrel was gripped in a machine vise, blocks with Vgrooves being used to hold the mandrel se-To get the curely. distance between the buttons on a circle 5 in, in diameter, is a simple calculation, and the buttons are set in the usual way. One button was brought into contact with an accurate block and the hole was then drilled.

The other holes were drilled in the same way. The job was entirely satisfactory.—Hugo Ljungquist, Philadelphia, Pa.



Reading the Incubator Thermometer

As incubators are usually installed in the cellar or basement of the home artificial light is necessary when reading the



Lamp Directly Above and Mirror Inside of Incubator Door Facilitate Reading of Thermometer

thermometer. An overhead light is practical for this purpose in most cases, and if a mirror is placed on the inside of the outer door of the incubator the reading can be done instantly. By opening the door of the machine, as shown in the illustration, the light from above is reflected on the instrument and the temperature noted without difficulty.—G. E. Hendrickson, Argyle, Wis.

Care of Oilstones

Oilstones should be properly cared for in order to retain the life and sharpness of the grit, to keep the surface flat and even, and to prevent glazing. With few exceptions, like the India and Crystalon, new stones should be soaked in oil for several days before using. An oilstone should be kept clean and moist. Allowing it to remain dry a long time or exposing it to the air tends to harden it. If the stone is kept in a dry place, it should be put in a box having a closed cover, and a few drops of fresh, clean oil poured on it. To restore an even flat surface on an oilstone, grind it on the side of a grindstone, or rub it down with sandstone or an emery brick. An oilstone can be prevented from glazing by the proper use of

oil or water; either will prevent the particles of metal that are cut away from the tool being sharpened from filling the surface of the stone. Plenty of water should be used on all coarse-grained natural stones. On medium or fine-grained natural stones, such as Arkansas or Washita, as well as on all artificial stones, oil should be used invariably, as water is not thick enough to keep the steel particles To further prevent out of the pores. glazing, dirty oil should be wiped off the stone as soon as possible after using. This is very important, for if the oil is left on the stone, it dries in, carrying steel dust with it. Cotton waste is one of the best things for cleaning a stone. If a stone does become glazed or gummed up, cleaning with gasoline or ammonia will usually restore the cutting qualities; but if this treatment is not effective, scour the stone with loose emery or a piece of sandpaper fastened to a flat board.—J. S. Hagans, Chicago, Ill.

Marker for Sheet Metal

Workers in sheet metal, whether tin, brass or copper, will appreciate the usefulness of the line-marking tool shown in the illustration. Owing to the flexible nature of this kind of material it is difficult to hold a marking tool in contact with the work, and this is especially the case on brass sheets thin enough to be shipped in rolls. With the tool shown, however, it is impossible to slip off the work, as the metal is guided between two parts as it is slid along. The ½-in. washers, held together and riveted by a short piece of



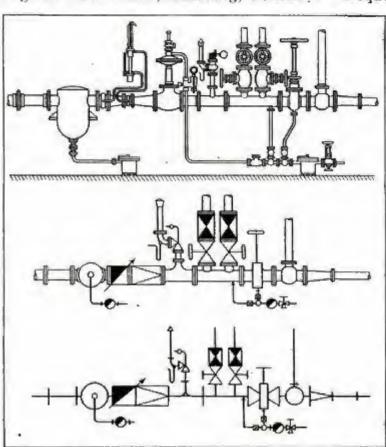
steel, make a good body for this tool. The bottom washer is used as it is; the middle one is cut away on one side to within about 1/16 in. of the hole, and the top one is bent up at the opposite side

and drilled for the marking tool or scriber. This is held in place by a cam tightener made from a piece of metal, as shown, or from a length of wire, one turn of which is taken round the scriber, a short piece being left for a handle. By filing the outside of the loop it is made to tighten when brought over to one side and loosen when

turned to the opposite. To mark off a strip of metal before cutting, the scriber is set the required distance with a scale from the middle washer and is tightened in place with the cam. Then, with the thumb pressing on the scriber near the point and the four fingers keeping the tool in contact with the edge of the sheet, it is slid along to mark any width of strip desired within the limit of the tool. It is, of course, not practicable to make the scriber too long, as the sheet of metal would then be likely to buckle.—Harry Moore, Montreal, Can.

Shorthand Mechanical Drawings

Complicated mechanical drawings may be simplified considerably by the use of symbols as shown in the illustration. The same steam piping is drawn in three different ways; the first showing the fittings drawn up in the usual way, the second showing the same somewhat simplified, and the lower one showing the drawing reduced entirely to symbols. Much work and time are, of course, saved by this method and the drawing is easier to read. A key of symbols is given in one corner of each drawing or separate key sheets. covering all the symbols used in each drafting department, may be issued.—Dr. Ing. Carl Commentz, Hamburg, Germany.



Mechanical Drawings Can Be Simplified Considerably by Using Symbols to Designate Parts



Winter Door for Receiving Room

Factory or store receiving rooms often cannot be kept warm and comfortable in cold weather because of the necessity of frequently opening a large outside door

to receive small boxes and parcels from delivery trucks, and where lumber or metal bars are being unloaded from cars on tracks outside the building, the door may have to be kept open for hours at a time. The discomfort from cold and loss of money in wasted heat may be partly prevented, if the bottom part of the door is cut and hinged so that it can be opened independently. A glass panel should be put into the upper section so that the clerk can see what is being unloaded.

Brass Locknuts

In practically every power plant, and in every plumbing and steam-fitting shop, numerous old brass globe and other valves collect, which are usually sold as scrap brass. Before doing this, cut off the hexagonal ends from the old valves with a hacksaw. They can be cut off in a few moments and make locknuts, which are thicker and therefore better than the ordinary ones.

Support Helps Turn Thin Walls

In turning up large cylindrical pieces, such as belt pulleys, etc., having thin walls, it is very difficult to prevent chat-



tering. However, this can easily be overcome by using a device of the kind shown in the drawing. A 3-ft. arm is made of heavy strap iron, about 3/8 by 11/2 in., and bent to the shape shown. A roller, about 11/2 in. in diameter and 1 in. long, is held in a U-piece made from strap iron which is fastened to the arm so that when the end of the arm is hooked inside the carriage the center of the roller will come even with the cutting tool. A piece of wire and a spring hold the bar, and this, in turn, gives the right pressure on the material at the cutting point. Being hooked inside of the carriage, the bar is kept just opposite the tool at all times as the tool moves. For turning the outside, the roller can be fixed to press on the inside, and the same result will be obtained. This device will instantly stop the chattering and will help do a much better job of cutting.-Ed Sundholm, Albert City, Iowa.

Don't Overlook Your Battery Charger

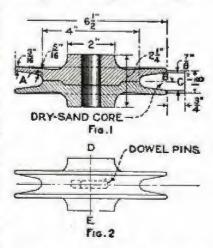
The life of a battery-charger bulb can be greatly prolonged if it is properly handled. It may become inactive because of a sagging filament, for instance. But if the bulb is inverted as soon as any sagging is noticed, it will last much longer.

At a battery-charging station this has been the practice for some time, and the owner has reclaimed a number of rectifying bulbs by simply mounting the socket, in or outside of the charger, so that it will hang in an inverted position. Sometimes the bulb will light, but will not charge, and this trouble can usually be traced to a loose socket connection. A badly sulphated, or dead, battery may also cause this trouble. Chargers, of the vibrating type occasionally cease to function before the battery has taken a full charge. If this happens, it is a safe bet that the adjusting screw has worked loose and the vibrating points are too widely separated. If the ammeter shows a discharge, the points are sticking together and should be separated at once.—Glen F. Stillwell, Collinsville, Ill.

Making Patterns for Small Sheaves

To the patternmaker with only limited molding practice, the making of a pattern for a small sheave pulley, such as shown in Fig. 1, for example, may be puzzling. He is not quite sure how the molder would prefer having it made, split on the line AB to be molded in green sand in a two or three-part flash or with a ring of green sand to make the groove, or perhaps a solid pattern with a core print turned on it as at B, Fig. 1, and a box to make the two half cores, these to be pasted together to form the groove. If the sides of the pattern are flat as in Fig. 2, he might be tempted to split the pat-

tern through the middle on the line DE, doweling the two halves together in the usual way. When but one or two, or a half dozen castings are wanted, it makes little difference how the pattern is made.



split or solid. The molder can produce the castings from a pattern made either way. However, I prefer a solid pattern with the groove made in dry-sand core; the pattern is stronger and will retain its shape much longer. If the bottom of the groove is sharp or has a small radius that does not call for machine finishing, the dry-sand core method is the better way, as the sharp green sand would wash away with the pouring of the metal. The method indicated in Fig. 2 is not desirable.

If these sheave castings are to be made in large quantities, it is well to take the

Siding Saves Time in Stonework

Use of framework and siding in the process of building stonework walls, has enabled an eastern contractor to save



Wooden Frame Aids in Laying Stone Walls and Eliminates Need of Plastering

matter up with the foundry. When making a sheave pattern split through the middle, the apprentice patternmaker insists on making the joint faces of each half pattern recessed, as shown in Fig. 1. When but a few castings are wanted, this recessing is unnecessary; it calls for reverse chucking of the two halves of the pattern. By chucking with the joint face against the chuck, the half pattern can be turned and finished on both sides in one chucking and then doweled together with a single pin in the center. I have made

them with only a piece of wire brad for a dowel. As an apprentice, the boy is taught to make his patterns up to a certain standard. A few visits to the foundry and a study of the jobs as they are made by the "old rounders" will convince him that it is not always necessary to line up to the so-called standard in the production of many patterns he is called upon to make .-M. E. Duggan, Kenosha, Wis.

much time in keeping the walls plumb, and the siding serves as a form to hold the inner facing of cement in place, eliminating the necessity of plastering after the wall is completed. The increased cost in erection appears to be more than offset by the saving in time.

Portable Desk for Shipping Clerks

Shipping clerks, inventory men, appraisers and others engaged in clerical work which necessitates moving about the

> , store or warehouse with facilities for writing, figuring and checking, will find much convenience in the adoption of a portable desk of the type now in use in a Wisconsin fac-The desk was originally a small writing desk. The back legs were shortened about 6 in., and a pair of wheels and an axle from a discarded baby carriage were attached to them. Two handles were fastened at top.

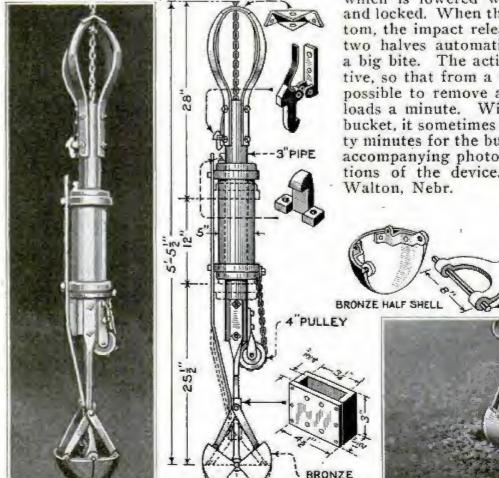




Vise Attached to Truck Tailboard Found Handy for Traveling Repairman

Tailboard Serves as Workbench

Obliged by the nature of his duties as truck inspector and traveling repairman to cut the working parts of his equipment to a minimum a mechanic, employed by a



Improved Sand Bucket Works Like Clamshell, and with Its Use, Five or Six Loads Can Be Removed from a 100-Foot Well per Minute

large oil company, utilizes the tailboard of his truck as a workbench, after having bolted his vise on it, as shown. The handy location and utility of the arrangement save much extra work and delay on rush jobs.—Richard C. Tarr, Gloucester, Mass.

Cleaning Auto Radiator

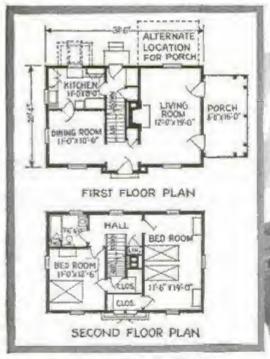
The tubes of Ford or similar radiators can be cleaned with a brass rifle-cleaning brush when the bottom tank has been taken out for repairs. This will remove the lime, oil and dirt inside of the tubes. Of course the brush must be used with care, or holes might be made in the tubes. The proper size of brush for the Ford radiator is a rod for a .22 rifle.—E. T. Gunderson, Humboldt, Iowa.

Improved Sand Bucket for Wells

The ordinary sand bucket for use in removing sand deposits from large wells, is not entirely satisfactory. The city plant engineer of the pumping station at Lincoln, Nebr., has designed an improved bucket which works on the principle of dam dredges. It is built for an 8-in, pipe which is lowered with the jaws opened and locked. When the jaws strike the bottom, the impact releases the lock and the two halves automatically close and take a big bite. The action is rapid and positive, so that from a well 100 ft. deep it is possible to remove as high as five or six loads a minute. With the ordinary sand bucket, it sometimes takes fifteen or twenty minutes for the bucket to fill once. The accompanying photos show the two positions of the device.-D. R. Van Horn,

STEEL PIN

Colonial House with Shingle Exterior





Plan No. 5A52

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THE charm of this design—its delightful homelike quality-does not depend upon expensive material or elaborate details, but upon good proportions, nice spacing of doors and windows, and the happy use of a delightful arched Colonial

In this home you will find a combination of good architecture and true build-

ing economy.

As planned, the house is of frame construction, exterior finished with shingles twenty-four inches long, laid eight inches to the weather.

The base is of cement, but might just as easily be of brick, if the owner desires. Stucco or siding can be used for the exterior, if preferred. The house will look equally well in either of these materials.

A fifty-foot lot is required if the porch is built at the side of the house. If placed at the rear, the house can be erected on a forty-foot lot. If the house is swung around and faced to the side, it can be accommodated on a thirty-five-foot lot.

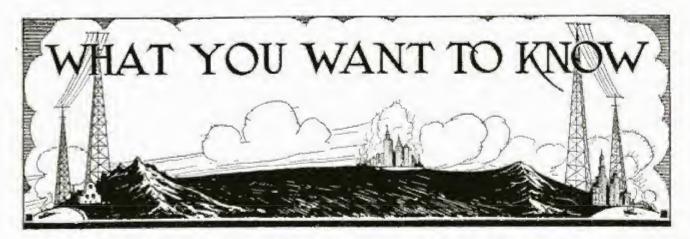
There are five good-sized rooms and bath, within a very small space. There is no waste in hallways, because this is the ever popular center-hallway type with a living room running full depth of the house. Two good bedrooms and a bath complete the second-floor arrangement.

The house was designed to face west or

north, but can be reversed if it is desired to face it in any other direction.

Home Builders' Questions

- Q. How can the exact amount of discount or bonus on second mortgages be obtained? A. The amount of discount on a second mortgage is flexible. It depends on what proportion of the whole cost of the house is covered by the second mortgage, for how long a time it is to run, and who the lender is. It is a common transfer to discount to the lender is. practice to discount this paper at so much per \$1,000. If the contract is for \$5,000, the discount may be four per cent per thousand. The borrower would then take \$4,000 cash and give a second mortgage for \$5,000.
- Q. We are thinking of buying a lot that has been filled with ashes and perhaps with other refuse. Can we build on this lot after it has settled? How long does it take to settle? A. It is not safe to build on a fill. It is very difficult to tell when settlement has been completed. The strength of this material is so unreliable that a building placed upon it probably will settle unevenly. If this takes place you will have cracked walls, cracked plaster, and more or less general deterioration. If you purchase this lot you should add the cost of excavation so you can build up from the original soil.
- Q. How much slope must a roof have for shingles? A. Shingles should not be used when the slope is less than thirty degrees. If the slope is less, the shingles will not turn water properly and will deteriorate very rapidly. We recommend sheet roofing for lowpitched roofs.
- Q. The paint on one side of my home comes off in strips. What causes this? A. When paint is put on wood that is even slightly damp, it will not adhere, but will blister, and come off in the long strips of which you speak. If there is some leakage from the roof or gutters so as to keep the wood continually damp underneath the paint, the paint will not adhere. To correct the fault have all the paint scraped off. Before any repainting is done see that the boards are thoroughly dried and that they will be kept so.



Q. What is the red terminal on the horn cord for, and how should it be connected to the plug? A. The red cord should be connected to the side of the plug that makes contact with the high-voltage B-positive side of the jack, as shown in Fig. 1. If your jack is not connected as shown, the right side can be determined by

HORN JACK

TO POSITIVE

B'-BATTERY

TO PLATE

OF LAST

TUBE

CONNECT RED CORD

TO TERMINAL

WHICH MAKES

CONTACT WITH

FRAME OF JACK

Fig. 1

trial, as the best results will be obtained when the polarity is correct for the microphone.

Q. Is a C-battery necessary with a resistance-coupled amplifier?

If so what voltages are necessary with 90 and 135 of B-battery? A. C-battery is neces-

sary to conserve the B-battery with any type of amplifier. If you use 90 volts of B-battery, use 4.5 volts negative bias. If 135 volts are used, the negative bias should be 7.5 volts.

- Q. How can I increase the selectivity of my five-tube neutrodyne receiver? A. Shorten your aerial, or reduce the number of turns on the primary of your first neutroformer. Reducing the distance between the primary and secondary coils also will result in greater selectivity.
- Q. I have three .00035 variable condensers and wish to make a tuned r.f. receiver; how shall I wind the coils so that they will be the right size for these condensers? I have some bakelite tubing, 3 in. in diameter, that I wish to use. Also please tell me what size of wire to use. A. For the two r.f. stages the primary should consist of 9 turns, wound over a secondary consisting of 50 turns. The aerial coil can be wound on the same size tube, and 80 turns should be placed on it. Cut each tube about 3 in. long, and use either No. 22 or 26 d.c.c. wire for all coils.
- Q. Would you advise the use of an a.f. transformer and two stages of resistance-coupled amplification? A. One a.f. transformer and two stages of resistance-coupled amplification will give excellent results. Both amplifier units should be of high quality; do not use a transformer of higher ratio than 3½ to 1.
- Q. What results have been obtained with the new underground antenna? Is it practical, and does it eliminate static? A. We have experimented with this type of aerial, and the results were very satisfactory. It reduces static effects and gives good clear signals over a wide range. There are several good types on the market in 75 and 100-ft. lengths.
- Q. Does a gas pipe make a good ground? I am using this type of ground and the results do not seem to be as good as I am told they should be. A. Gas pipes sometimes have rubber and other insulating materials at the joints and therefore make poor grounds. The use of gas pipes for grounds is also prohibited by the insurance companies. Steam pipes also sometimes have

rubber gaskets at the joints and the connecting bolts cannot be depended upon for good connections. A cold-water pipe offers the best type of ground.

- Q. Can two stages of r.f. be added to a regenerative set? Will it increase the volume and range? A. The volume and range would be increased to a very small extent; the addition is not practical, considering the cost.
- Q. I am having a great deal of trouble with body capacity in my set. When the headphones are touched, the stations are often lost; how can I prevent this? A. Ground one side of your filament battery if it is not already grounded. Also try connecting a .002-mid. fixed condenser across the primary of the a.f. transformer. You may find it necessary to shield the instrument panel, but try the other suggestions first.
- Q, Would straight-line frequency condensers improve my tuned r.f. receiver? Would I get better selectivity? A. These condensers will spread the stations out over the dial, giving a greater apparent selectivity, and make tuning easier on the crowded lower end of the dial. However, the selectivity of the set may depend on other factors that cannot be remedied by changing the condensers. Try a shorter aerial or reduce the number of turns in the aerial coil.
- Q. Is it possible to make a good variable gridleak of the pencil-mark type? I have tried several leaks of this type, but do not seem to get good results with the hard tubes. A. It is very difficult to make a good gridleak of this type. We would advise you to purchase a variable gridleak. They are inexpensive and give satisfactory results.
- Q. Can UV-199 or C-299 tubes be used in the perfecttone six receiver described in the November, 1925, issue? A. We do not advise the use of the small tubes in this set. Best results

set. Best results are obtained with standard A-tubes.

Q. I have two 4½-volt C-batteries of the tapped type; how can I connect them so as to obtain a 4½ and a 9-volt negative grid bias? Also please show me how I can get 6 volts negative for the UX-112 tube at 90 volts. A. The diagram is given in Fig. 2. The upper batteries are connected so as to obtain

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TUBE ONLY

45 VOLT

C-BATTERIES

Fig. 2

ed so as to obtain Fig. 2
4½ volts negative
bias for the UV-201A tube at 90 volts and 9 volts bias
for the UX-112 tube at 135 volts. The lower diagram
shows how to obtain 6 volts bias when using the UX112 tube at 90 volts.

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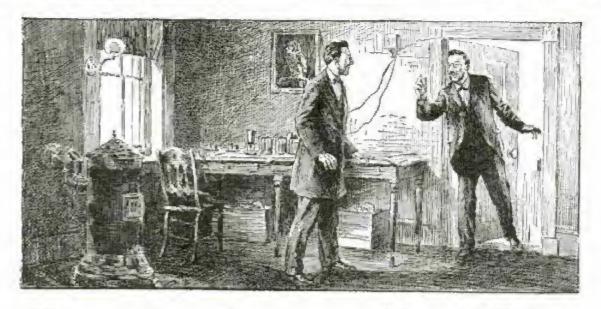
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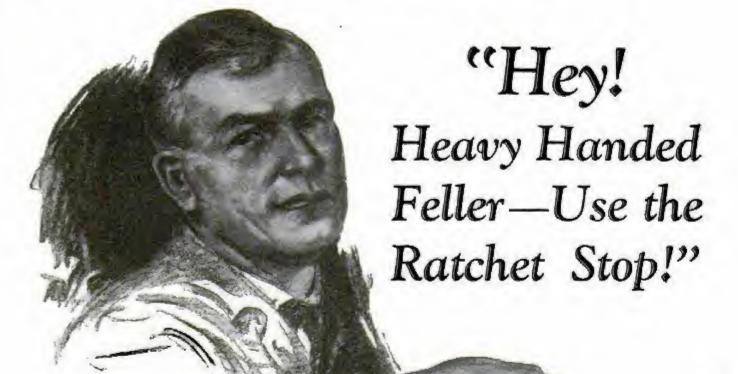
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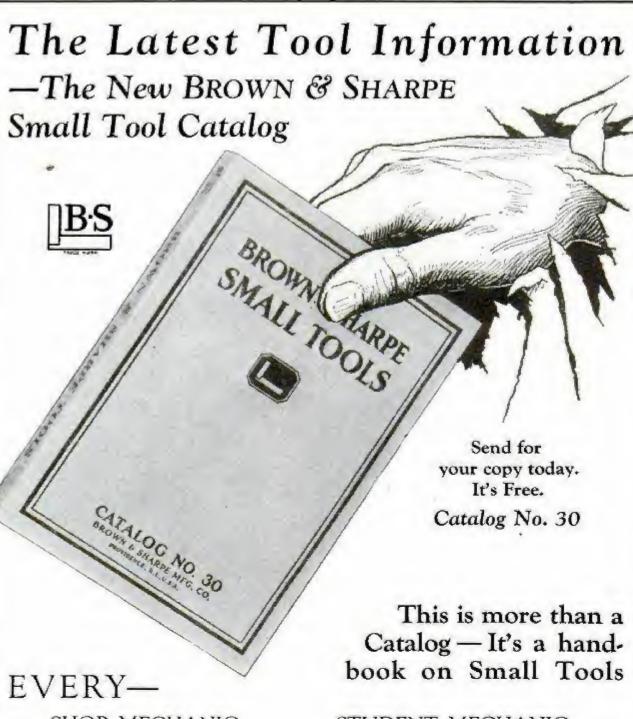
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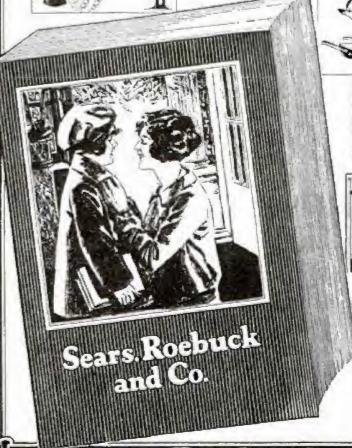
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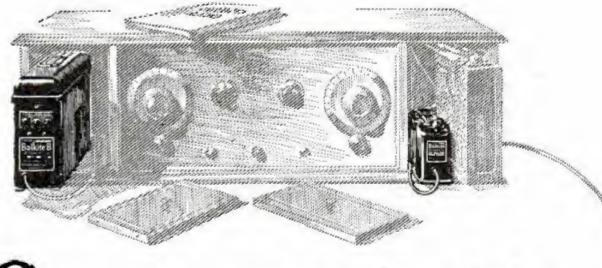
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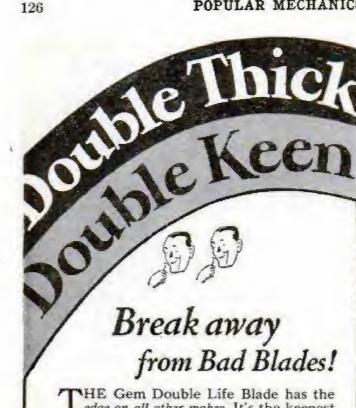
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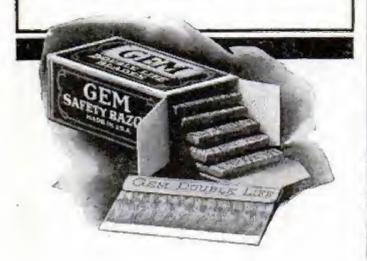
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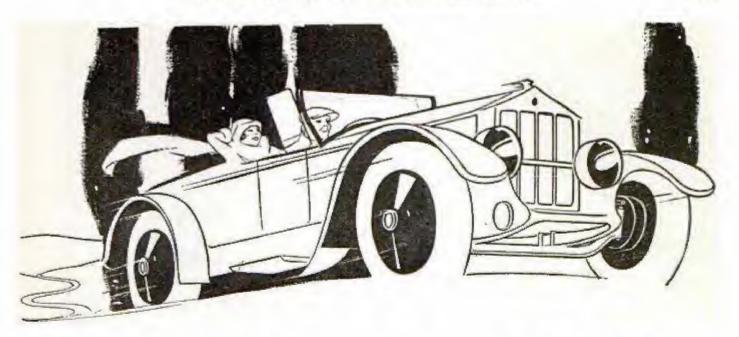
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Now you can cut your gasoline cost as low as 9c a gallon. An amazing new invention makes practically any car give twice its regular mileage to the gallon—many run from 37 to 57 miles, and even up to 61 miles on a galion of gasoline! This wonderful invention is the work of Mr. J. A. Stransky of Pukwana, South Dakota. Already it is being used by over a million satisfied car owners-on all makes and models of cars. And now the inventor will send you a sample at his own risk! Read



The Stransky Vaporizer is one of the biggest sales propositions of the the biggest sales propositions of the century—you can make big money quick. But don't take our word for it. Read what these men say. J. W. Cronk made \$51 in one hour. He says: "The results of one hour's work—17 men gave me orders for the vaporizers."

\$120 in One Day

I have found out that the Stransky will do what you said it would. I took forty orders in one day, and wasn't out long. My Ford runs better than it ever did. I can

\$147.50 in One Day
My profits for one day were
\$147.50. In one week I made \$280Yes, I am always on the Job.—S. E.
Herrick, Ore.
\$48 in 3 Hours

My gas bill has been cut nearly in half. I have removed every particle of earbon from my engine. Since I installed it, my engine runs as good as new, starts easier and quicker. I went out Saturday about three hours and secured 16 orders.—J. A. Williams.

Earn \$250 to \$500 a Month

tion is making fortunes for agents instead of burning. and distributors. Now you, too, can make big money—just telling your friends about it. You can easily earn astonishingly big profits in full or spare time-many are earning \$34 to \$69 every day. There is no reason in the world why you cannot start out with this astounding invention and clean up \$250 to \$500 every month.

Here's how this wonderful little device works. Every carburetor is adjusted to make starting easy-it gives a rich mixture to start a cold engine. But once the engine gets heated up the mixture is far too rich, resulting in faulty explosion. Half the gasoline is drawn into the cylinders in a raw state, and, instead of exploding, it burns. This causes a heavy deposit of carbon.

But with this startling little device in a car all this is changed. As soon as the engine warms up, this device automatically begins to admit a much larger volume of air, thoroughly vaporizing all the gasoline, giving it fully 50% more power L

And now this amazing new inven- -breaking it up so that it explodes

To introduce this new invention, Mr. Stransky, the inventor, will send a sample at his own risk. Not only that, but he will actually pay you for testing his Vaporizer if you are not delighted with it.

The demand for the Stransky Vaporizer is enormous. Agents handling this device are simply coining money. Every auto are simply coining money. Every auto owner in the country—and there are twenty million of them-wants this splendid new invention the minute he sees it. Just send the coupon at once for full details of our introductory sample offer. Be the man to cash in big in your community.

J. A. Stransky Manufacturing Company

C-960 Stransky Bldg.	Pukwana, So. Dakota
r - Mail This C	oupon Today —
J. A. Stransky Mfs C-960 Stransky Ble Pukwans, South D	
	n get samples of the
Name	
Street or R. F. D	
i City	State



IF you have wanted to get into business for your-self, in a live, hustling field, here's the opportunity you have waited for!

We want a live, hard-working sales representative in every locality to build up a big business on the Harley-Davidson Single, the new-type motorcycle. Easier to sell than cheap cars on a basis of travel economy and flexibility. So miles to a gallon of gasoline! No parking or garaging problem. Nearly every man between the ages of 15 and 50 is a prospect.

With our advertising, sales-help and organization backing you, a most profitable business can be yours-if you are a worker.

Write for full particulars. Do it today!

HARLEY-DAVIDSON MOTOR CO. DEPT. P MILWAUKEE, WIS.

EY-DAVIDSON

New-Type Single Motorcycle

See our other advertisement on Page 120



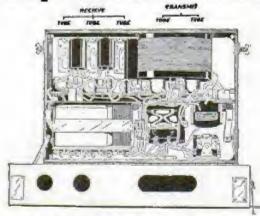
Information on any book free. Write Popular Mechanics Press, Chicago, III.



Saw Table Can be purebased with 6-inch 522.50 delivery paid East of Mississippi. S13.90 Delivery paid East of Mississippi. Cord, Plas and flat or grooved Palley, Guarasted 50%. Overhood, Special Prices on Quantities of 10 or Over.

PAUL J. DEVITT, 1101-1107 So. 2nd St., Phila., Pa.

100 Famous U. S. Army Aeroplane Radio Sets



MADE BY WESTERN ELECTRIC COMPANY 5 Tubes for Transmitting and Receiving

Here is your opportunity to get most wonderful Radio Set on the market. Receives and transmits by turn of switch. Receiving range 190 to 600 meters. A slight change necessary to transmit on assigned amateur wave lengths. Lives depended on reliability of this set during war. Rubber cushioned and insulated thruout. No vibration—state or distortion. Ideal for Home—Auto—Boat—Clubhouse or Portable Use.

SPECIAL PRICE OFFER \$3965 WHILE THEY LAST-Reg. \$138 Set-Only

We understand these Sets cost the government \$138. Only by special arrangements were we able to get 100 Sets and offer them to the public at this sensational price. Regular standard equipment is used for receiving. Any transmitter tube having same base as W. E. Co. power and oscillating tube may be used with this Outfit. The greatest buy in Radio Today.

DON'T DELAY! Write today for complete details. Orders will be filled casting and Receiving Sets won't last long. Reserve yours today!

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We furnish everything for converting Ford Auto Chassis with Engine into a landy Farm Tractor. Just right for truck growers, small farms, nurseries, etc. Pulls 16" Plow, Discs, Seeds, Cultivates; Runs Beit Machinery. We also build Garden Tractors and Cutter Bar Mower Attachments.

Write for Free Particulars.
SHAW MFG. CO., Dept. F, Galesburg, Kan.



SHAW MOTOR ATTACHMENT

MAKES YOUR BIKE A MOTORCYCLE!

A high grade 21½ H. P. motor attachment quickly clamped on any bike frame. Speed 4 to 40 miles an hour. 90 to 125 miles per gallen of gos.

Special Low Price Now! Write today for Complete Description and Special Low Prices on Shaw Motor Attachments and the Shaw Complete Motorbieyele.

SHAW MANUFACTURING COMPANY Dept. 37



With this saw you can make your own repairs in shop, home, farm or garage. Makes a clean edge on the toughest wood—no planing necessary. Rips, cross-outs, bevels, miters, mortises, tenons, or grooves. Attach to any lamp socket. Weight only 61 lbs. Will cut up to 11/4 All metal. Saw size 6 in. Table 10x13, base 7x11, height 7 in. Table tilts for beveling 5 degrees left, 10 degrees right.

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GENTS

500% Profit

Selling Genuine Gold Leaf Letters

Guaranteed to Never Tarnish

For Store Fronts, Office Windows, Bank Windows, Office Doors, Panels, Board Signs, Trucks, Automobiles and Glass Signs of all kinds. No experience necessary. Anyone can put them on and make money right from the start without previous experience. All you have to do is to show your samples, the letters are very attractive and easy to sell. Letters costing 4c sell for 25c. One agent says: "Your letters are the best thing I have seen in years. I have made \$125.00 the first week and still going strong." Paul Clark says: "Smallest day \$28.70." H. Gilder made \$835.00 in six weeks.

\$60 to \$200 a Week—Now Is the Time

General Agents It is easy to appoint sub-agents for this line. We pay you 20% cash commission on all orders we receive from local agents appointed by you anywhere. We allow you 50% discount on your own orders. You can self to nearby trade or travel all over the country as you please. Large demand for window lettering everywhere. WRITE TODAY for free sample, full particulars and liberal offer to general agents.

Our Agents Are Coining Money READ WHAT THEY SAY

Makes \$38.75 in Two Days
Gentlement Enclosed please that order and M. O. of \$4.00. Send balance C. O. D. I expect the next order will be a larger one, as I have plenty of sign work on hand. I will send you a picture of the lob I have done here. I made \$38.75 in two days, and have about \$150.00 worth of orders already taken, besides many promises.
Yours truly, A. E. WEINTRAUB, Helena, Ark.

Gentlemen: Please find enclosed \$7.75 for order enclosed. Times are not good here, and this is a small town. However, I sold over \$25.00 worth in three hours. When I leave here and strike a live town, look out for my smoke. I am more than pleased with results, Belleve I can make \$25.00 per day in a good town. Will send for a supply when these are up. Please send these by mail. I enclose extra stamps.

Towns for business.

J. B. TOWER, Portales, N. M.

Takes in \$62.80 in Two Days

Gentlemen: I received the order here today all O. K. and am wiring you tonight an order to be sent to East Radford, Va. I put up \$27.70 worth of jobs here today. I got \$35.10 out of Marion, Va. You may send me 500 more letters C. O. D. to Bristol, Tenn., on receipt of this letter.

Yours truly,

F. E. DURAWAY, Bristol, Tenn.

MAIL COUPON AT ONCE METALLIC LETTER CO., 430 N. Clark St., CHICAGO, ILL.

Be a Traveling Sign Man

For a quick, easy money-making proposition for agents, salesmen and sign painters, there is nothing to equal the selling and putting on of our gold and silver metallic letters for office windows, store fronts, bank windows, and glass signs. No experience is necessary. Anyone can put them on and succeed right from the start. You can sell to local and near-by trade, or travel all over the country as you please.

Metallic	Letter	Co., 430	0 N.	Clark St.	, Ch	icago
Please s	end free	sample,	full	particulars	and	liberal

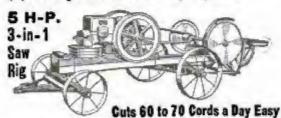
offer to general agents.

Address.

City_ State.

Saws 25 Cords In 5 Hours"

Any hustler can make big money with the one-profit WITTE Saw RIG—Ed. Davis sawed 25 cords in 5 hours—another user sawed 40 loads of pole wood in 3 hours. Hundreds of owners make \$3,000 to \$5,000 a year. Sold on Easy Payments.



A real all purpose outfit for farmers and men who make wood sawing a regular business. When not sawing you can fill silos, grind feed, shell corn, thrash and do other work. Easy to start at 40 below zero. Completely equipped with WICO Magneto, speed and power regulator, throttling governor and 2 fly wheels.



Cuts down trees and saws them up FAST—one man cuts 10 to 15 cords a day—makes ties. The WITTE is easy to run and trouble-proof. Thousands in use. Powerful engine runs other farm machinery. Uses all low priced fuels. EASY Pay only a few dollars down and take a PAYMENTS — MAKE YOUR OWN TERMS.

EE Write today for full description if interested, ask for our Engineer Pump catalogs,

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You can start a business of your own, no experience neces-sary. Only machine that will make first keys without taking lock apart. Makes a dozen duplicate keys per minute.

Write Today for Full Particulars

BEISSER KEY MACHINE CO. 407 Fort Street, East

Detroit, Michigan



You ought to have this handy Parks in your shop!

A compact, complete machine designed just like a big production outfit at one-fifth the cost. Nothing extra to buy. Motor is included, operating from any light socket. Fits in a corner of your basement. Does any kind of cabinet and joinery work. Circular saw, jointer and bandsaw on permanent all-steel frame. Add lathe, shaper and other attachments at small cost. You can make money with this Parks! Write for circular.

The Parks Ball Bearing Machine Co. 1500-1540 Knowlton Street, Cincinnati, Ohio Canadian Factory: 200 Notre Dame East, Montreal, Can.



Send 35c for an All-Work File to FAYETTE R. PLUMB, Inc. PHILADELPHIA 4817 James St.



Sent Parcel Post Prepaid if not at your Dealer.

Niagara Metal Stamping Corp. Niagara Falls, N. Y. Dept. 201



CALCULATIONS

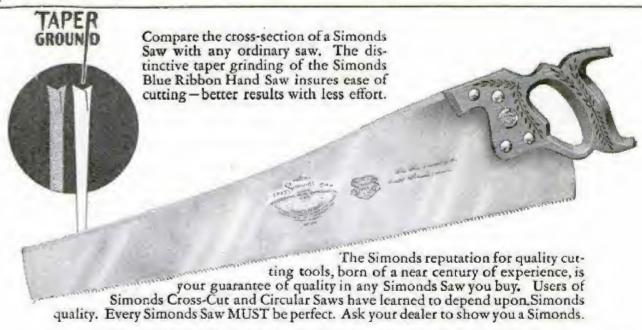
in Office, Echcol. Store and Shop can be instantly reads with the Midget Slade Rule. It gives the answer to any problem involving fractions, misad-numbers, decimals, whole-numbers, roots, powers, Loys, and Trig. Functions. Thousands of these rules are used by Accountants, Engineers, Carks, Students, sto. It is the most versatile calculator ever invented. If you have any fauring to do, order a Midges Slide Rule on trial. Mode of shuminum with figures on white calculated. Size 4".

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Your mancy back if you are not satisfied.

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SIMONDS SAW AND STEEL CO., FITCHBURG, MASS.

"The Saw Makers"

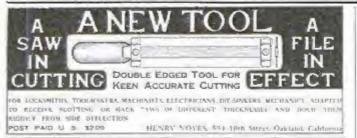
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Established 1832

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Pronounced SI-MONDS

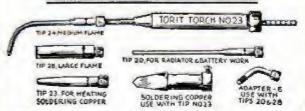
SAWS FILES KNIVES STEEL



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Because it means extra value—ATKINS blades are "file tested," insuring longer life and quicker, easier metal cutting. It pays to use better blades.

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E.C.ATKINS & CO. Est. 1857 Dept. P. INDIANAPOLIS, U. S. A. Leading Manufacturers of Saws for Every Use, Saw Tools, Saw Specialties and Machine Knives

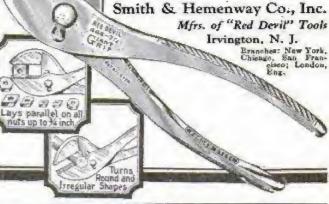
It's New-It's Different-"RED DEVIL" Giant Grip No. 444

Combines a plier and wrench; it's the greatest improvement since pliers were invented. The "444" has solved most of the plier and wrench troubles. So many things can be done with it that it's the most universal tool made. No springs, no adjusting nuts, no mechanism.

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Conserve Your Health and Efficiency First "I would not part with it for \$10,000"

Sowrites an enthusiastic, grate-ful customer. "Worth more than a farm," says another. In than a farm," says another. In like manner testify over 100,000 people who have worn it.

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Overcomes WEAKNESS and ORGANIC AILMENTS of WOMEN and MEN. Develops erect, graceful figure. Bringsrestfulrelief.comfort.abli-ity to do things, health, strength.



Wear it 30 Days Free at Our Expense

Does away with the strain and pain of standing and walking; replaces and supports misplaced internal organs; reduces enlarged abdomen; straightens and strengthens the back; corrects stooping shoulders; develops lungs, chest and bast; relieves backache; curvatures, nervousness, ruptures, constipation, after effects of Flu. Comfortable, easy to wear.

Keep Yourself Fit Write today for illustrated booklet, measurement blank, etc., and read our very liberal proposition.

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It costs nothing to investigate. Write me today and I will send you full particulars by return mail and place before you the facts so that you can decide for yourself.

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Made by agents selling our wonderful Facial Soap, Perfumes, Toilet Articles, Spices, Extracts, etc. Free cake of soap and agents' terms mailed to any address.

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Unlimited earning possibilities. X-Cel-All Master-Lite scientific lighting a necessity wherever artificial light is used. Churches, schools, factories, etc., etc. Completely assembled HOME OUTFIT ready to attach to light socket, sells \$3.95. You collect and keep \$1.00. We ship to customer C.O.D. for balance. Try this and be convinced, then become permanent member of fast growing organization. Write or wire at once.

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HANDIEST TOOL IN THE KITCHEN. Housewives all say" Just what I want." The Ideai Fiber Cutter is a real household

Fiber Cutter is a real household aid. Tested and Approved by Good Housekeeping. Two minute demonstration sells it—100 PER CENT PROFIT. Boorem, Pennsylvania says, "Have bought my home and car with Cutter profits." Bassett, Washington, new agent, writes, "Made \$7.50 in 2 hours today." You can do as well. No experience needed. (Work spare or full time. Write for details THE TYLER MFG. CO. Dept. M-5 Muncie, Indiana







Pick a live wire. Don't waste any more time. Self Stylemor starts and make your hours count! 150 snappy, popular styles. Low prices. Smart selfing outfit FREE. You only take orders. We deliver and collect. Highest commissions in advance and your own shirts free for a little work on your part. Unusual proposition, Write as today.

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Everyone a prospect. Sells for \$1.00, your profit 65c. Free deliveries. Guaranteed.

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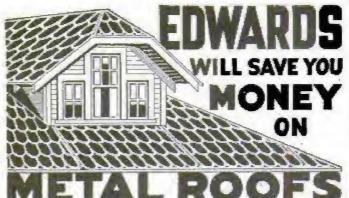
Story and a half semi-

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Price includes all lumber cut to fit; highest grade interior woodwork, siding, flooring, windows, doors, glass, paint, hardware, nails, lath, roofing, with complete instructions and drawings. Freight paid to your station. Permanent Homes—NOT PORTABLE. Many styles of year round dwellings, summer cottages and garages to choose from. Write nearest mill today for FREE Money-Saving Catalog No. 1544

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OUTLAST THREE ORDINARY ROOFS

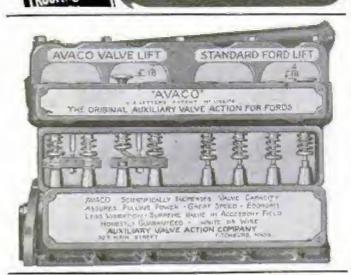
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YOUR TIRES FREE: Simply send name today for valuable FREE BOOK; tells how thousands have gone into his beginness, SPECIAL AGENTS OFFER. Wholesals Frices and FREE SAMPLE RET. Write peacest address.

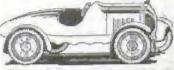
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Bodies of Rare Beauty for Fords At Factory Prices!

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Write for Circular A-2 show-ing this Model and others.

SPORT BODY WORKS AURORA, ILL.



This model in grey prime, \$39.50



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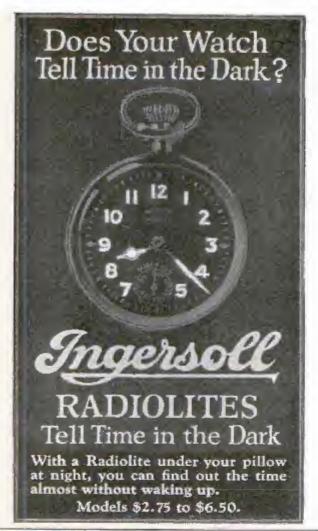
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Earn 100 a Week Profits in Advance

I pay men \$100.00 a week and up by my plan which I want to send you at once. Be your own boss, work where and when you like. You can do fine even without previous experience. Biggestvalues—positively sellon sight.

Profits in Advance



My plan pays biggest profits and commission in this line, all paid in advance, we attend to

Sell fine delivering orders and collections.

TAILORING

Astonishing values get orders easy when you show samples of our tailored to order, all wool, suits and overcoats—one price \$31.50. Our advertising helps you take orders quick.

FREE!

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Also complete sales manual, we place you in Big Money Class.

W. Z. Gibson, Inc., Chicago

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Without obligating me in any way, please send me complete information regarding your new plan to earn \$100 weekly.

State

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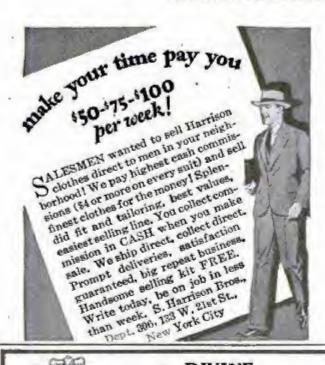
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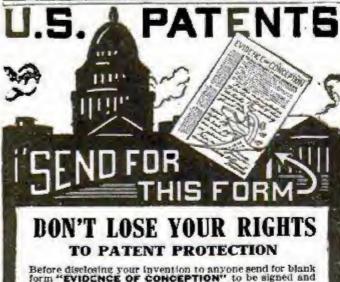
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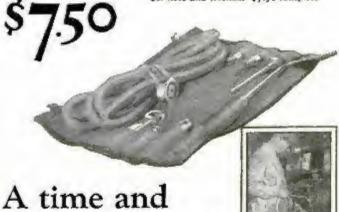
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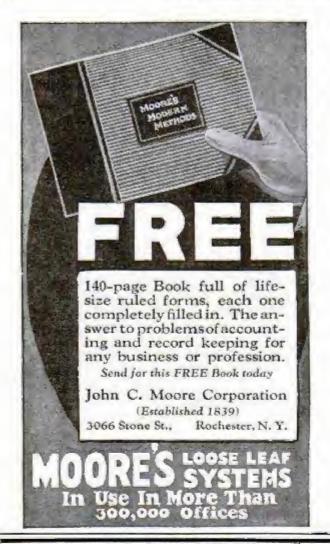
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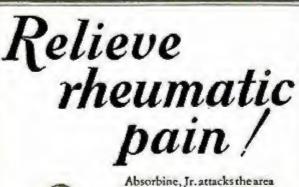
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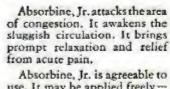
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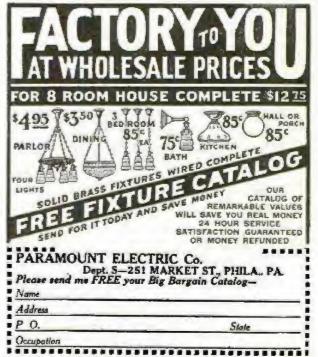
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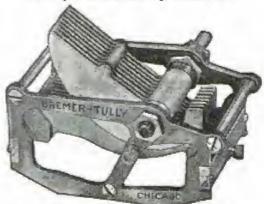
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The B-T Straight Line Frequency Condenser has no equal in the number of superior features. Quality is the B-T watchword—and thru 20 years of RADIO experience, B-T know what is best for RADIO users.

The B-T line has no trick parts or trick claims. Before you buy, examine the B-T product—your judgment will do the rest.

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Price \$10 and up purchased through our Co-Operative Plan for as low as \$1.00 down and \$1.00 per week Indians Harley-Davidsons Ace Henderson and Clevelands Molorcycles thipped to all parts of the world

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O RADIO fan wants to put up an outdoor aerial more than once, if he can help it. That is why the experienced set owner installs a Beldenamel Aerial.

Every strand of a Beldenamel Aerial is carefully coated with baked Beldenamel to resist the corrosive action of atmospheric fumes and smoke. A bare copper aerial soon corrodes and becomes inefficient. A Beldenamel Aerial lasts for years without deterioration.



clearly labeled for your protection against substitutes. By using a 150-foot length, the aerial wire can be used as a lead-in without joints.

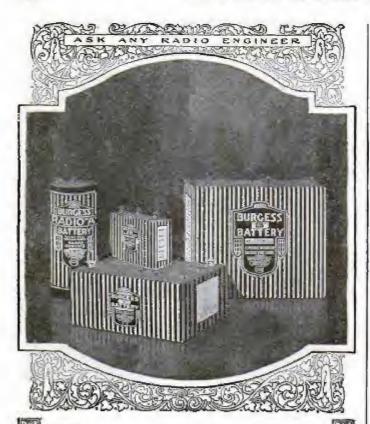
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Please send me your latest illustrated booklet, free, describing Belden Radio Products and their use in Radio work.

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ERY probably hidden away in the cabinet of your receiving set, the batteries you use are nevertheless surrendering their power unseen and unheard.

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explaining liberal proposition paying agents \$60 to \$100 a week and how to get latest radio goods at Wholesale. Live dealers and agents wanted.

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We win 80 out of every 100 men to this unique creation

Say the word

And we'll send you a 10-day tube of this unique shaving cream to try

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The way we win new customers to Palmolive Shaving Cream is by giving men a 10-day tube to try.

In less than five years we've gained top place in that way.

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It's different from any other shaving cream known. 60 years of soap study stand behind it. We tried out 130 different formulas in perfecting it.

It embodies the four great essentials 1000 men told us they wanted in a shaving cream, plus a fifth that we ourselves found and added.

5 Important features

You'll find it superior in at least five major ways:

- -Multiplies itself in lather 250 times.
- Softens the beard in one minute.

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Now in courtesy to us, will you accept a test of our shaving cream; give us the opportunity to prove the claims millions make for it?

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To add the final touch to shaving luxury, we have created Palmolive After Shavin: Tale—especially for men. Doesn't show, Leaves the skin smooth and fresh, and gives that well-groomed look. Try the sample we are sending free with the tube of shaving cream. There are new delights here for every man who shaves. Please let us prove them to you. Clip cream. The who shaves, coupon now.

10 SHAVES

3141



new. As you survey the rooms of your own home, picture what a delightful transformation a new piece of furniture here or a suite there will bring.

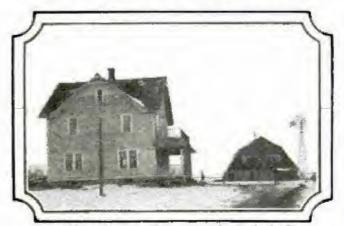
The New Larkin Book Offers the Ideal Way

There's a cheerful, helpful plan whereby you may place these desired furnishings in your home NOW and pay for them on the most convenient liberal terms-The Larkin Better Homes Plan. The new Larkin Catalog pictures suites, tables, lamps, rockers, rugs, curtains, silverware, china, etc., and tells of this plan which delights thousands of home makers. There's a copy Mail Coupon To-day of this book for you.

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and a can of Palmolive After Shaving Tale Simply insert your name and address and mail to Dept. B-1135, The Palmolive Company (Del. Corp.), 3702 Iron Street, Chicago, Ill. Residents of Wisconsin should address The Palmolive Company (Wis. Corp.), Milwaukee, Wis.	Send me my copy of the new Larkin Catalog No. 219 picturing fine furniture for every room of the home, and telling of the popular Larkin Better Homes Plan. Name
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This Farmer's Experience Can Be Yours

"I came from Norway to Viroqua, Wis., in 1898, and raised tobacco there, but decided to come to Canada, so in 1905 I landed in Wetaskiwin and drove 85 miles east where I homesteaded 160 acres, In 1909 I sold my homestead and went back to Norway. In 1910 I returned to Alberta and bought my homestead back and three-quarter section of school land.

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"Our markets are good, low freight rates, good government. Schools are of the best and churches of all denominations. We have good neighbors and many are from the States in this part of Alberta. I feel like I have done better here than I could either in Norway or the U.S.

"I think this is the place for a man to get a start. The climate is good, although cold in Winter the air is dry. It will pay anyone from the States looking for a home to come look over Western Canada."

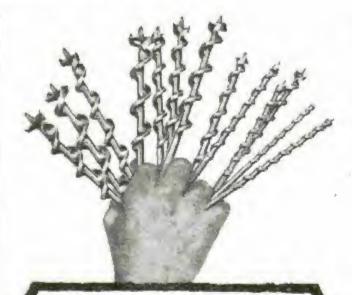
(Signed) LARS P. SATHER Alberta, Can., Nov. 19, 1925

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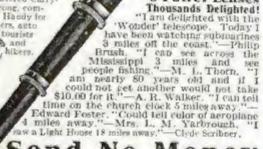


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seem close. Brings new pleasures to home, farm, camp, travel, sport. See moon and stars as never before. New Ferry "Wonder" telescope has 5 sections—over 3 ft., long open, 12 in: closed.

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They went like wildfire from the start. It was the very thing men everywhere had been hoping someone would invent. would invent. It's ANYONE CAN a common thing to sell six to a customer. ANYONE CAN SELL THEM! The Stay-Prest puts in knife-edge crease, removes baggy knees and smoothes out entire surface. Easy to use—takes only a few seconds. Saves nap of cloth. Looks rich. Folds to 15 inch package. Over 1,000,000 satisfied customers prove that the article is right. 4 Patents.

OOK AT THESE RECORD

G. M. Stewart, W. Va., tried selling this big re-peater in spare time and made \$33 his first week so decided to devote full time to it.

S. D. Mathews, Minn., gave this a trial as a side line. He made \$17 in his first two hours and de-cided to devote his full time to the work.

J. W. Varner, lowa, made over \$500 the first month he sold this big money-making specialty. Mrs. Helen Rhodesby, Oklahoma, made \$32 the first day she tried selling this device. She is now one of the most successful "salesmen" of it.



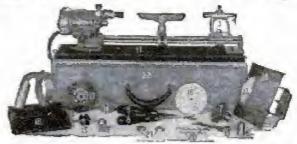
Your profits in advance on this big new specialty and it sells quickly—average sale made in 8 minutes. 40% profit to you. Big repeater. You simply write orders. We ship and collect. You simply write orders.

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15 in. Long	case. (ree. The: Duthi ha	Stay-Pr s every	rest fold thing be	s into nes ecessary t	ing Outst t light, co o begin a spare tin	mpaet t once
and make the	\$100 to	\$150 a v	reek ful	i time.	Simply	mail the o	oupon

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Attaches to any lamp socket. All packed under pressed steel case (No. 22 above) with lathe bolted to platform 25 in. x 6 in.

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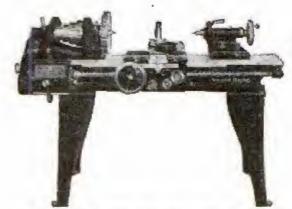
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13 inch Swing over Bed, 5 ft. Bed, \$387 Quick Change Gear. Net Factory Price Easy Payments if Desired.

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Write or send coupon below for a Free copy of this New Lathe Catalog.

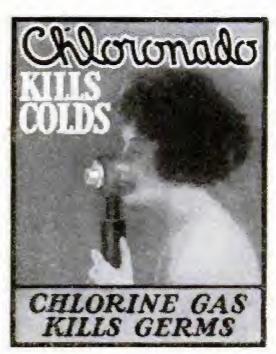
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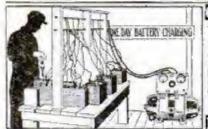
Works fast. Slides in and out quickly. Durably made of brass trimmed boxwood. Any length 2 to 8 feet,

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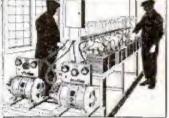
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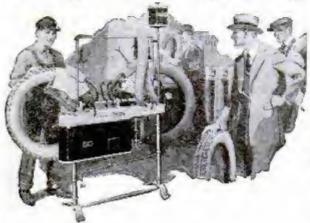
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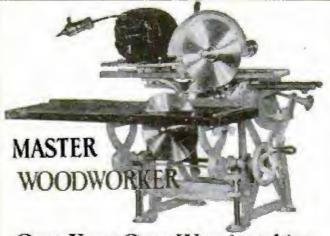
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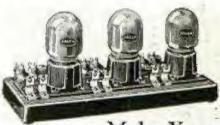
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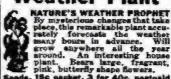
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atems two to three feet high and rapidly assumes a test
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The tops of the steens are surmounted by a whorl of unbrella-shaped leaves, of a wary appearance, we will
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bashes, and thus can
be caliveted in the
amalest garden. The
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almost to the rind
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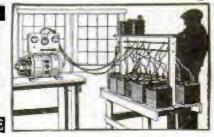
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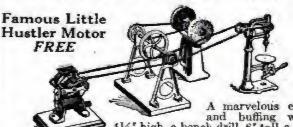


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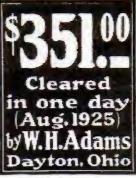
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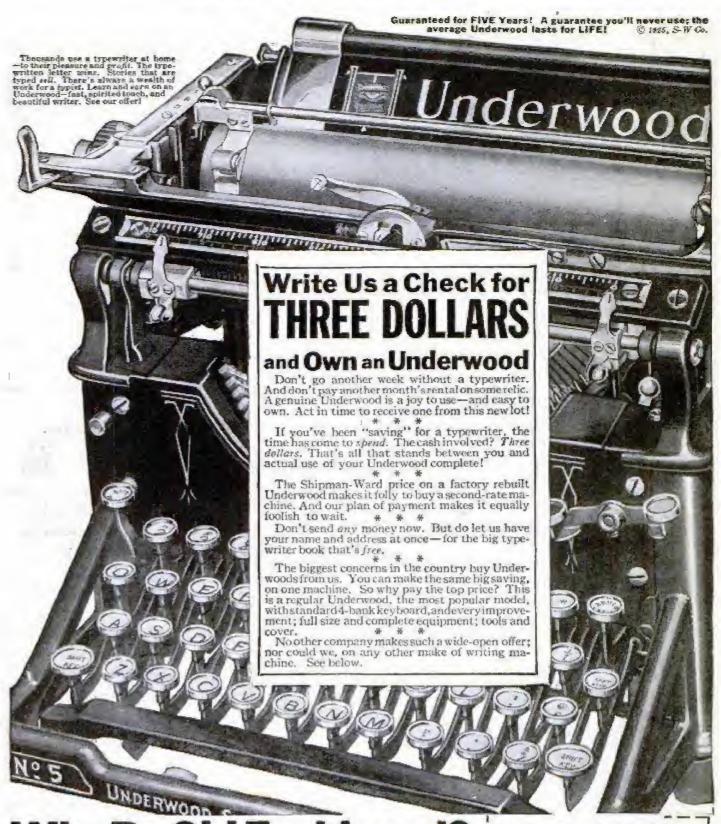
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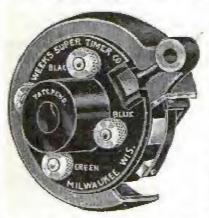
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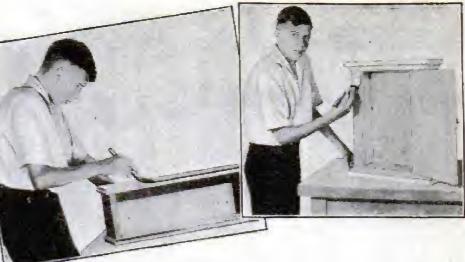
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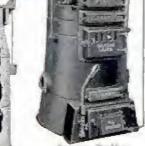
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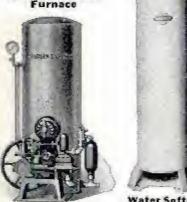
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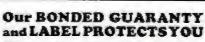




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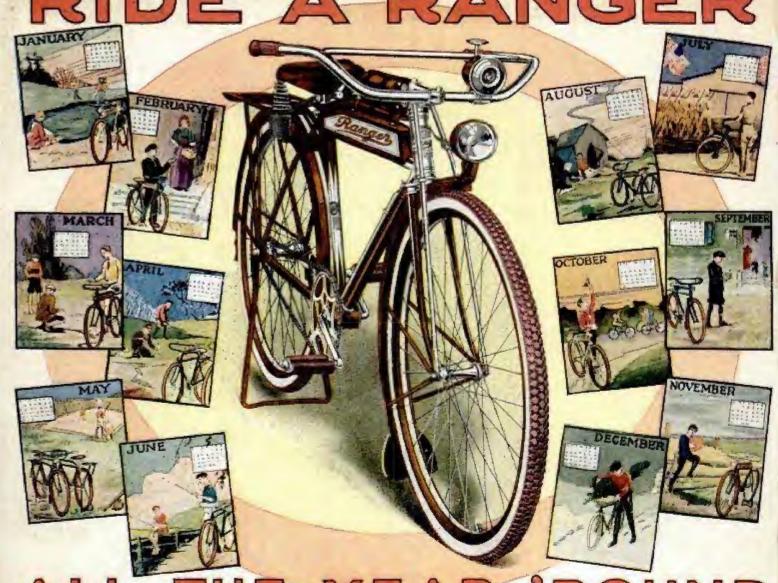
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